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# THE JOURNAL OF SOUTH AFRICAN BOTANY

*Published under the Authority of the Trustees of the  
National Botanic Gardens of South Africa,  
Kirstenbosch, Newlands, Cape Province  
Editor : R. H. Compton*

Supplementary Volume No. I.

## THE GENUS OXALIS IN SOUTH AFRICA

A TAXONOMIC REVISION

By

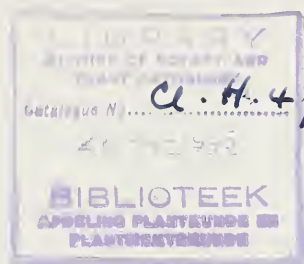
Paymaster-Captain T. M. SALTER, R.N. (Ret.)

*(With 10 Plates and 73 Text Figures by the Author)*



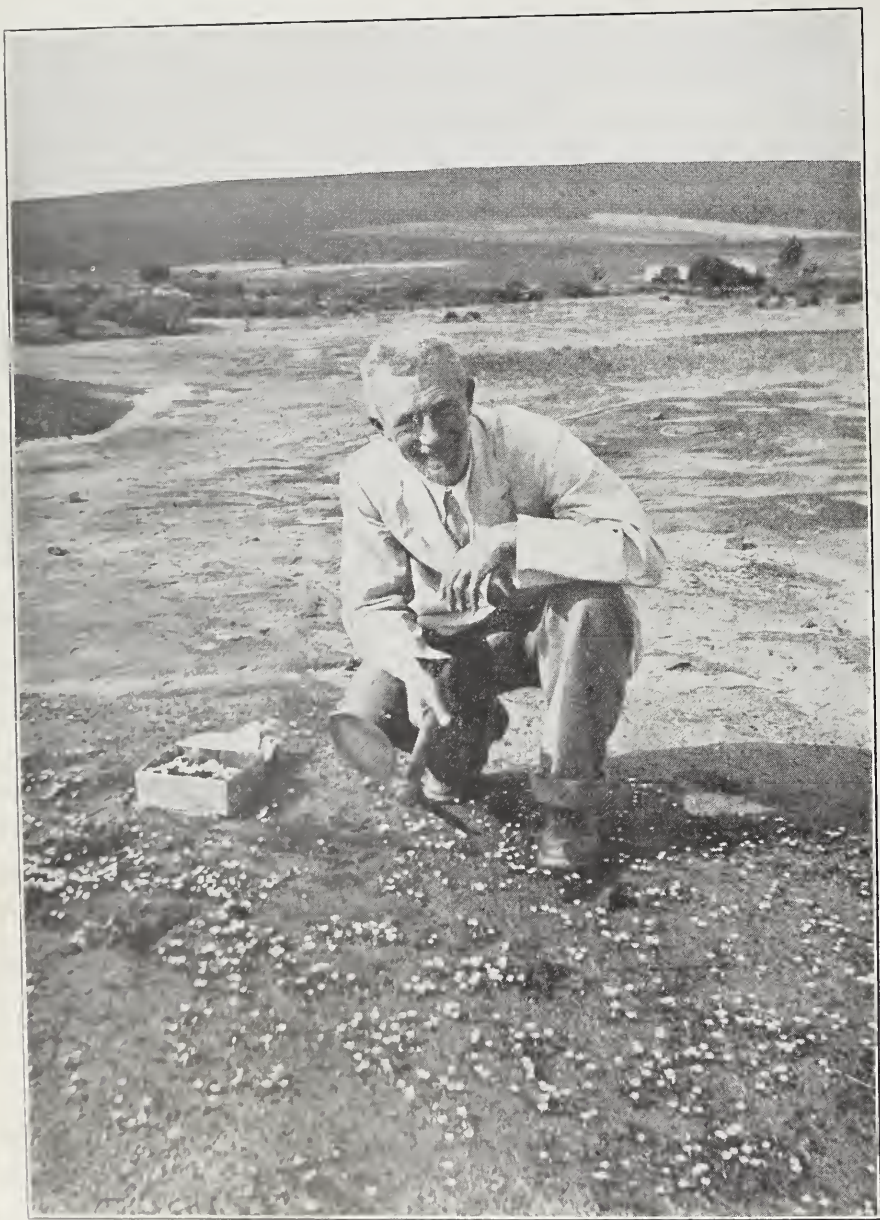
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THE AUTHOR.

[Photo : S. Garside.

*Oreals simplex* Salter and *O. monophylla* L., var. *minor* Salter growing in association at Brandewyns River, Clanwilliam Div.

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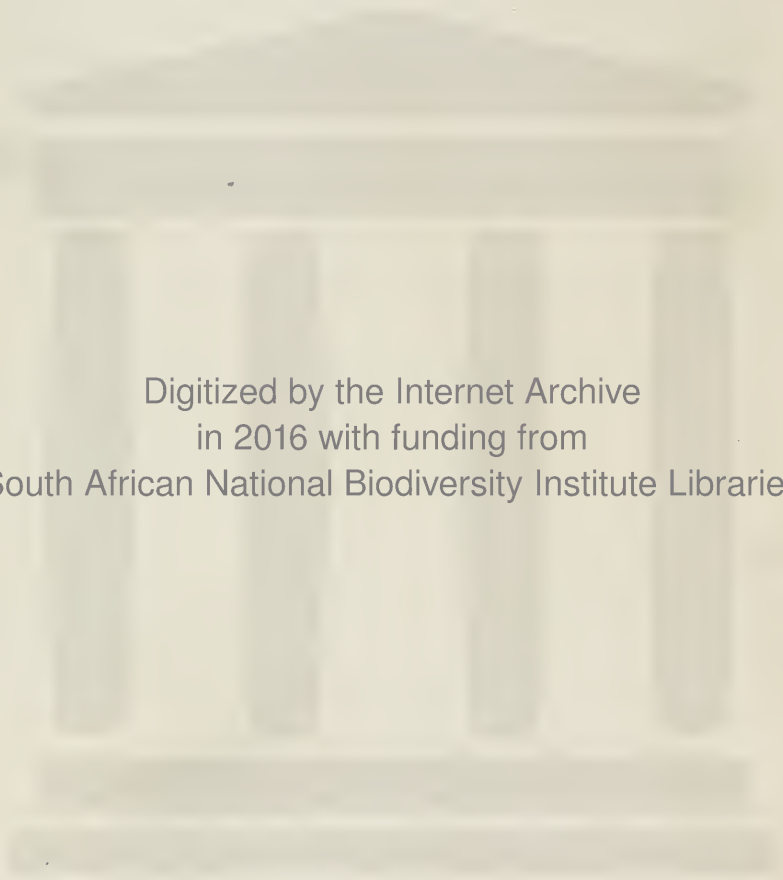
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Page 16, par 6, line 3, for "Sessiliflorae" read "Sessilifoliatae".  
 Page 25, penultimate line, for 266 read 226.  
 Page 30, par 6, line 3, for "Sessilifoliae" read "Sessilifoliatae".  
 Page 38, par 2, line 1, - do -  
 Page 45, par 4, line 2, for "petioles" read "pedicels".  
 Page 175, penultimate line, for "Sessilifoliae" read "Sessilifoliatae".

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*-A list of Abbreviations employed will be found immediately before ex.)*

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(Note.—A list of Abbreviations employed will be found immediately before the Index.)

### I. GENERAL INTRODUCTION.

The genus *Oxalis* was named by Linnaeus the Elder and takes its name from the Greek words ὄξύς, acid, and ἅλς, salt, in allusion to the acidity of the foliage. As Jacquin has pointed out, however, the name *Oxalis* was used by the ancients for a species of *Rumex* (Sorrel), whereas the name "Oxys" was applied to the present genus by Pliny the Elder.

Although it is among the most prolific of the South African genera in number of species and varieties, it has hitherto received comparatively little serious systematic study. While it is true that a great number of species have, from time to time, been named and described, almost all previous taxonomic work has been the outcome of superficial examination of dried and usually very imperfect specimens in herbaria in Europe. (See Part II, Previous systematic work.)

With the exception of Jacquin's species, which were described from cultivated plants, only a very few species (those of Dr. L. Bolus) were dealt with in the living state. It is true that the collectors Ecklon and Zeyher and Schlechter described plants which they had themselves

collected, but it was obviously done some time afterwards and without any knowledge of the characters which it was necessary to examine.

The present study is the result of some 11 years of observation of the *living* plants, either in their natural habitat or in cultivation\* and while I have necessarily been obliged to include some plants which I have not seen in the living state, I have been able to give accurate descriptions of the bulbs, of the important floral characters, which cannot be well ascertained from dried specimens and of the type of seeds of the great majority of the species. Further, this more detailed examination has made it possible to correct many previous misconceptions and also to group the species more in accordance with their natural affinities. (See Part IV (ii), Arrangement of the Sections.)

GEOGRAPHICAL AREA.—The area covered is the Union of South Africa and the Mandated Territory of South-West Africa. The latter area is not, as far as is known, particularly rich in *Oxalis*, but it will probably be eventually embodied in the Union and some of the species recorded there occur in the Union itself.

I have not personally visited S.-W. Africa, nor have I collected eastward of Port Elizabeth and most of the plants from these districts are only known to me from dried specimens. Though the species occurring in the Eastern Province, Natal, Orange Free State and Transvaal are comparatively few, they form complex groups which I have found it exceedingly difficult to classify and, since nothing of much value can be achieved without field study, I have, of necessity, had to treat them cursorily, though I have alluded to the difficulties in notes under the species in question. I hope some future worker will be able to investigate them more fully in the field.

The great bulk of the species, however, occur in the western coastal belt from Cape Town to Namaqualand, including the western parts of Ceres and Calvinia Divisions. Along the south coast they are only a little less prolific and a number of species are peculiar to the Little Karroo. It is in these areas that my own comparatively extensive, yet far from adequate, collecting was done.

The work lacks some of the recognised desiderata of a complete monograph. Although circumstances have prevented me from examining the collections in the European herbaria,† I have been able to inspect the majority of the *types* or *co-types*, some of which have, through the kindness of the Directors, been lent to me. I have not seen the wild

\*In the course of travelling some 40,000 miles, mostly by car, I collected nearly 2,900 sets of specimens, 600–700 of which I have also had under cultivation.

†I have looked through the collections at Kew and the British Museum, but thus was long before I had sufficient experience to make any critical comment upon them.



specimens collected by Boos and Scholl,\* from the bulbs of which many of Jacquin's plants were grown and figured in his *Monographia*, but these species are so well illustrated that their identity can hardly be mistaken. In some cases where I was in doubt, I have, through the courtesy of Dr. Karl Keissler at Vienna, been able to have critical comparisons made with my own specimens.

The majority of the important specimens of the principal early collectors, Ecklon and Zeyher, Drège and later Schlechter have been cited, together with nearly all the specimens of certain locality in South African herbaria. The greater number of individual casually collected specimens which have found their way into European herbaria, if not *types*, are not of much scientific interest. Many sets, *including co-types*, from my own comparatively extensive collecting have been widely distributed. With a few exceptions, in which case it has been so stated, no specimens have been cited unless actually seen by me.†

Again, owing to the impossibility of consulting some of the more or less obscure botanical works which are not available in this country, the synonymy is not entirely complete, a matter of no practical importance. (See Part V, Synonymy.)

The work is almost entirely the result of my own observations. A fairly full summary of all the previously published work on the genus will be found in *Das Pflanzenreich* (A. Engler) *Oxalidaceae* (1930), pp. 1—38, by R. Knuth. Some new observations on heterophylly, heterostyly and pollination, hybridisation, teratology, epharmonic variation and seed-germination will be found in the later parts of the present Introduction. In Part XII, Notes on the Principal Organs, I have endeavoured to give a summary of the variations occurring in the different organs and their reliability in taxonomy. A vast field lies open here for future investigators.

The study of *Oxalis* presents great difficulties. Unlike many genera in which practically all the salient characters can be examined in the herbarium by soaking or boiling fragments of the crucial parts of the plants for dissection, the important characters in *Oxalis*, such as the details of the floral structure and the all-important root-system, can only be ascertained correctly from living plants and, indeed, the latter characters are still very imperfectly known. With two exceptions, I have made

\*See Part III, Notes on the Principal Collectors.

†Except in the case of the *type* or other specimens of peculiar interest, in order to save space, those of the commoner species which only bear herbarium numbers and no personal serial number, are cited without the name of the collector, for such specimens can be identified by the herbarium number alone. The names of a few of the better known collectors have been abbreviated and, owing to the very large number of specimens of my own collecting cited, I have abbreviated my own name to *S.*, in order to avoid its constant repetition. (See abbreviations, p. 350.)

it my rule not to describe new species unless I have examined them in the living state.

More extended collecting has shown too that the genus does not lend itself readily to exact systematic classification and I have found that the task of dividing the plants into definite taxonomic units, species, varieties, etc., extremely difficult.

It is, perhaps, not generally realised that only a proportion of the existing forms are yet known. The genus is one of the most prolific in South Africa, both in quantity and variety, and all collectors of *Oxalis*, including myself, have only explored a small fraction of the huge and often somewhat inaccessible areas in which this genus abounds, areas in which, during the main *Oxalis* season (mid-winter) there is little else to attract a botanist. My own comparatively extensive collecting has been done almost entirely along the few roads which exist. Great areas, such as Bushmanland, are as yet quite unexplored in this respect and since many of the species and forms are exceedingly local, one may speculate on the variants still to be discovered. I am myself aware of a few apparently new species, which, for one reason or another—inadequate specimens or uncertain locality—I have left among the “*Incertae*”. For the information of future students of the genus, however, I have given imperfect descriptions of three of these plants (*without names*) in Appendix I. A tempting field for the name-at-any-price systematist.

Although there exist a considerable number of what seem to be fairly clearly defined species, the genus contains many large composite species (or “group-species” as I have for the present termed them), which consist of inter-related micro-varieties, so numerous and overlapping so inextricably that they seem to defy detailed classification as fixed units. These variants are to a great extent local geographical, but not epharmonic forms and the plants found in such colonies, large or small, are generally all of one pure strain. A number of chance specimens from these groups (often imperfect and without the all-important bulb) have found their way into various herbaria, principally in Europe, and, since some of the extreme forms look rather different, have been described and named as distinct species by botanists who had no conception of the complexity of the genus and were quite unable to see their affinity one to another.\* (See Part II, Previous systematic work.)

It may be that in the future botanists will be able to undertake detailed field observation of these group-species, and classify them

\*I have myself made the same error. Of the seven species of my own early collecting, which I described in collaboration with Mr. A. W. Exell in *Journ. of Bot.* LXVIII (1930) 143–6, I have since found three to be unworthy of retention, and I know that my collaborator will forgive me for saying that we fell into the same trap.

systematically, but I suspect that with the accumulation of more and more material, they will be found to be even more complex than they appear to be at present.

Many botanists have attempted to give definitions of those very indefinite taxonomic units, species, sub-species and varieties. All these definitions, so far as I understand them, seem to pre-suppose some knowledge of how they have evolved, either genetically, by mutation or geographical isolation. This knowledge is entirely lacking as far as South African *Oxalis* are concerned and perhaps will always remain so. When all is said and done, a species still seems to be "*what the best-informed (or least-ignorant) systematist considers to be a species.*"

I have considered many theories which might account for the present unstable state of these groups, but I am not able to suggest any plausible explanation. I have seen no evidence of mutation beyond occasional doubling of the flowers. (See Part VIII, Hybridisation very rare.)

Even apart from the complex groups referred to, the conception of species and also of varieties in such a genus must be on the broadest lines\* and it has been deemed advisable to make wholesale amalgamations of many of the existing so-called species, owing to the chains of intermediate forms which connect them.

Excluding a few plants from Madagascar and Tropical Africa, 204 species appear in Pffrch-Oxal. as occurring in South Africa. Adding the 107 species either omitted from that work or described since its publication, we have a total of 311 recognised species. Of this number only 208 are now upheld, and of these, 9 had previously been treated as synonyms or varieties.

Varieties have only been upheld when they are clear-cut, generally speaking, with at least two obvious characters at variance with the typical form and many of these varieties would have previously been given the status of a species. But if such variations as different flower colours, the shape of the leaflets or the presence or absence of glandular hairs were taken alone as varietal, as has previously been the practice, the number of named varieties would become legion.

For the citation of specimens, however, many of the species have been divided up into Forms (A, B, C, etc.), the term being employed for the less marked and more vague variants, but it is used in a wider sense than that generally understood and is not associated with epharmonic variation in any way. I cannot pretend, however, that these divisions are always

\*In principle I agree very strongly with the remark of Mr. C. E. Hubbard—"In the preparation of the Floras of large tropical areas, our knowledge of which is still imperfect, it is advisable to group together all the variations of a polymorphic species rather than to give such variants sub-specific or varietal names." (Proc. of the Linn. Soc. 151st Session, 1938—9, Pt. 2, p. 104.)

consistent and some specimens have been frankly cited as intermediates. I can only hope that some well-meaning herbarium systematist will not, for the purpose of exact pigeon-hole botany, apply names to them.\*

LOCALITY RECORDS.—No geographical records, beyond the fact that the plants were natives of the Cape of Good Hope, were made by the earliest collectors and the localities in which many of the *types* were collected are unknown. This is particularly unfortunate in the case of Jacquin's species. In a flora where so many micro-varieties exist, the importance of this matter cannot be insisted upon too highly and specimens, especially types, of unknown or *inaccurate* origin are entirely without any scientific interest.†

In a large country, where towns are so far apart and where there are so few definite landmarks, it is not always easy to give these records accurately. In cases where the names of farms have been given I have often found them very difficult to trace. Apart from those from the vicinity of well-known towns the great majority of my own specimens have been collected close to the main roads and the locality on the ticket is given in miles (actually recorded from speedometer readings) and a rough compass direction from a town, village or other recognisable landmark. Thus, for the record "8 miles N.W. of Malmesbury" a glance at the map will show that the road to Hopefield is indicated, rather than the north road to Piquetberg or the west road to Darling. Since my collecting took place before the building of the new national roads, it should be understood that the roads in question are those which were in existence from 1931 to 1939.

In the citation of specimens, as exact a locality as possible is given for the *type*, when known, and also for specimens of the more uncommon species and varieties. For the common plants the Political Division only is given, the Cape Peninsula being treated as a unit in this respect. Thus the geographical range of each species can be seen and future investigators in South Africa will have access to the specimens in the various herbaria if more exact information is wanted. I would repeat that genuine systematic work *can only be carried out in this country and from living plants*.

HABITAT.—The great majority of the species are sun-loving plants

\*Sonder in *Flora Capensis*, in his endeavour to reduce the South African *Oxalis* to some sort of systematic order, suggested certain varieties, and, with the limited material at his disposal, being obviously uncertain in some cases of their real validity, designated them with Greek letters rather than names. A later systematist, with less knowledge of them than even Sonder, applied his own epithets to these tentative varieties, regardless of their real value and, as far as one can judge, with the sole object of advertising his own name.

†Specimens with false or doubtful localities have been omitted from citation whenever possible.



and grow on open plains and hill-sides, frequently amongst scattered shrubs. The typical habitat has only been mentioned where it is exceptional. Some species have a preference for temporarily water-logged ground and others for partial shade, but *O. incarnata* is the only species which can be described as a true shade plant. In the § Campanulatae, *O. natans* and *O. disticha* are seasonal aquatics, while *O. Drègei*, *O. simplex* and *O. uliginosa* are seasonal marsh species, but all of these are subjected to bone-dry conditions except in the growing season.

## II. PREVIOUS SYSTEMATIC WORK.

Of the 208 species of *Oxalis* upheld in this work, 8 were named by Linnaeus and 5 more by his son. The first account of the genus of any importance is Jacquin's *Oxalis Monographia* (1794) with fairly detailed descriptions and 71 excellent coloured plates\* of South African *Oxalis*, made from plants grown from bulbs obtained in South Africa by the collectors Boos and Scholl and grown in the Hortus Schonbrunnensis at Vienna, with the addition of a few uncoloured drawings made from dried specimens lent to Jacquin by Thunberg.† Seven more coloured plates and descriptions of *Oxalis* appear in Jacquin's other works. That only 22 of the species named by Jacquin can be upheld is to a large extent due to the fact that he failed to recognise heterostyly in the genus. His success in cultivating *Oxalis* was remarkable.‡

Thunberg, in his "Dissertation on *Oxalis*" (1781), described 3 new species, but otherwise his work is of little interest. The two synonyms which stand to his name, viz. *O. cernua* Thunb. (*O. pes caprae* L.) and *O. humilis* Th. (*O. purpurea* L.) have attained to more notoriety than they deserved. (See notes under these species.)

Sonder, in his painstaking attempt to give an account of the South African *Oxalis* for the *Flora Capensis* Vol. I (1860), upheld 108 species, of which he described 47 as new, but of these, 28 have now been reduced to synonymy. He had the hopelessly difficult task of trying to reduce to some order the badly collected specimens of Zeyher and Drège. He

\*These plates are the work of Johannes Scharf, a young pupil of Jacquin. (See Journ. of S.A. Bot. VIII (1942) 223; Baron Jacquin and the Schönbrunn Gardens, by S. Garside.)

†In these uncoloured drawings two noticeable errors occur, which are referred to later under the species *O. minuta* and *O. monophylla*. The coloured plates, which of course represent plants grown under artificial conditions, call for little criticism, but there has, I think, been a certain amount of artistic licence in the representation of some of the bulbs.

‡In the Introduction to his *Monographia*, p. 2, Jacquin gives a detailed account of his treatment of *Oxalis* in cultivation, with a warning for the protection of the bulbs, during their resting season, from the ravages of mice (*murium voracitati*). A similar danger is presented by moles in South Africa.



was fairly correct in upholding only 9 of Ecklon and Zeyher's species from the maze of inadequate descriptions, synonyms and misidentifications published in *Enumeratio Plantarum I* (1835) and he added descriptions for the first time to the manuscript names given by Meyer in *Zwei Pflanzengeographische Documente von Drège* (1843). He worked, however, entirely from dried specimens. Sonder did not specify which sets of specimens he regarded as the *types* of his species, but where specimens are to be found in his own herbarium (at Stockholm), I have preferred these as the actual *types*.

For some time after the publication of Sonder's account there was a lull in the creation of new species. In 1898—1900 Schlechter (see Part III, Principal Collectors) described 21 plants of his own collecting as new and of these only 10 can be upheld. His descriptions are loose and very imperfect and, from the mass of manuscript names and misidentifications on his tickets, it is obvious that he did not attempt to acquire any systematic knowledge of the genus and was more concerned with selling his plants than studying them critically. He is celebrated as a collector rather than a systematist.

In this century commenced that haphazard and reprehensible custom of what I might term "Clearing up the Incertae" in herbaria, by workers who named and described all the wretched imperfect dried specimens which would not fit exactly into Sonder's key. This unfortunate practice reached its climax in the publication of between 50 and 60 new South African species in Engler's *Bot. Jahrb.* (1927) and *Pflanzenreich-Oxal.* (1930), all from wretched specimens in Berlin herbarium, more than half without bulbs, many without localities and some even without flowers. Five of these had been already named and described by Mr. F. Bolus in *Annals of Bolus Herb.* II (1918) from identical *co-types*. Through the courtesy of the curator, Dr. Diels, the majority of the *types* were lent to me for inspection. At least two-thirds of these must pass into synonymy.

I believe that in the majority of herbaria the genus is now arranged in accordance with this *Pflanzenreich* volume. In my comments on this publication I am, of course, referring solely to that part which relates to the South African species. It is in actual fact, merely a compilation made from *Oxalis* literature amplified by the citation, frequently erroneously, of the specimens in the Berlin herbarium. The species are arranged without any regard to their natural affinity and since the author has in some cases relied for his descriptions, in whole or in part, on plants misidentified by the commercial collector Schlechter, instead of consulting the *types*, the most ludicrous errors have arisen.\* Numerous

\*See the species *O. Zeyheri*, *O. Sonderiana* and *O. leptocalyx*.

other mistakes have been pointed out in the present work.

It is scarcely necessary to mention De Candolle, in *Prodromus* I (1824) and Savigny in *Lam. Encycl.* IV (1797) as their work in connection with *Oxalis* consisted mostly of compilation. The former described one new species and the latter three. Ecklon and Zeyher's *Enum. Plant.* I, already referred to, can scarcely be considered seriously as a contribution to systematic botany.

The 65 species which stand under my own name as the author have been put to the same searching test as all the others which I have upheld. With a few exceptions, I did not commence publishing new species until I had spent several years in intensive field work, by which time I had found that a considerable number of my tentative manuscript species were not sufficiently clear-cut for retention.\*

### III. NOTES ON SOME OF THE PRINCIPAL COLLECTORS.

As most species of *Oxalis* flower in mid-winter, it is not perhaps surprising that there has been so little collecting in the more out-of-the-way parts of South Africa. Had it not been that the collectors Boos and Scholl and later Zeyher made their journeys to Namaqualand in the winter months, many of the species which they discovered would probably have lain hidden until many years later. Until I began my own winter journeys to Namaqualand, there was little or no evidence of any other *Oxalis* collecting there at this time of the year.

FRANCIS BOOS and GEORGE SCHOLL.—A most interesting account of the visit of these two Austrians to South Africa has recently been published by Mr. S. Garside.† These two collectors left no account of their travels, but it is known that they made a winter journey to Namaqualand in 1786 and it was on this expedition that they probably collected many of the bulbs from which the plants figured in Jacquin's *Oxalis Monographia* were grown at Vienna.

At Mr. Garside's request I furnished him with an analysis of the distribution of these species, together with the following deduction as regards the route probably followed.

"The species included indicate that Boos and Scholl, Jacquin's collectors, probably took the old route to the west of Piquetberg and Olifant's River Valley and after passing near Klaver and Van Rhyn's Dorp, kept some miles to the west of the present road to Namaqualand;

\*As many of these specimens were distributed under names other than those now allotted to them, a complete list of them, in numerical order, showing the final determination, is given in Appendix II.

†Baron Jacquin and the Schönbrunn Gardens, by S. Garside (*Journ. of S.A. Bot.* VIII (July, 1912).)

a route also followed later by Zeyher at least as far as Garies. This seems to be borne out by such species as *O. cuneata* Jacq. and *O. glandulosa* Jacq., both of which have only been rediscovered about 20 miles to the west of Bitterfontein and Garies respectively, although, of course, the range of these species is not yet exactly known. As regards the northern limit, all the Namaqualand species occur between Garies and Kamieskroon.\*

As there are wild specimens of some of the species preserved in the Imperial Museum at Vienna, the collectors must have been in the Van Rhyn's Dorp Division and Namaqualand about May, June and early July. The absence of a number of common species which must have been observed by a slow-travelling party on this route, is probably explained by the bulbs dying off or failing to flower."

At the time of writing the above, I was quite unaware that I was confirming the opinion of the late Dr. O. Stapf, who had arrived at a similar conclusion from an analysis of the distribution of the species of *Aretotis* described by Jacquin.†

KARL ZEYHER was in South Africa from 1823 to 1868. He collected widely in the western belt as far north as Namaqualand, along the south coast to Uitenhage and in company with Burke in the Little Karroo. Most of his specimens are starved and he seems to have been unfortunate in the seasons in which he collected *Oxalis*. His widely distributed specimens, some with his own manuscript tickets, some with what appear to be temporary tickets and some with printed tickets cut from the *Enumeratio Plantarum I*, Ecklon and Zeyher (1835), have been sadly mixed in distribution or mounting. There is a good representative set of his plants in the South African Museum at Cape Town.

He seems to have followed no system in numbering his specimens, at any rate they are not in sequence of collecting. From knowledge of the geographical distribution of the species, I have found a few of the localities given to be false. Those given for Zeyher's or Burke and Zeyher's numbers between 244 and 255, viz. Berg River, Hex River or Berg and Hex Rivers, seem to be erroneous and were probably written from memory some time after collecting.‡ The geographical limits of

\*Kamieskroon is not marked on many South African maps. It is a small village about 2 miles south of Bowiesdorp, which has now fallen into ruins.

†Bot. Mag., t. 9127.

‡All these tickets show the month of May, without the year, but the sequence of numbers gives no clue to the order in which the specimens were collected. Zeyher's *Journal* of his travels with Burke, published in Hooker's *London Journal of Botany*, Vols. V and VII, does not cover the districts in question, but presumably they returned to Cape Town via the Hex River and Tulbagh in company. Burke took this route, in the opposite direction, alone in May—June, 1839, on his journey to Uitenhage and writes in his journal (*Ibid.* Vol. IV) of seeing *Oxalis*, but he did not reach the Hex River until June.

the species in question are now known and they belong to two quite different floral regions, namely (i) the upper Hex River, northeast of Worcester and (ii) Berg River (probably, from the evidence of the plants, between Berg River and Little Berg River) in the south-western part of Tulbagh Division.

The following table shows the localities given on the tickets and the actual floral regions in which the species are known to occur. The names in italics, now synonyms, are those employed by Sonder in *Flora Capensis* Vol. I.

Number.	Species.	Zeyher's locality.	Actual floral region.
244	<i>tomentosa</i>	Wolverivier	Tulbagh Dist.
248 ex. p.	<i>Zeyheri</i> *	Berg River	Hex River.
248 ex. p.	<i>ciliaris</i>	Berg and Hex Rivers	Hex River.
	<i>Mundtii</i>		
249, 254	<i>droseroides</i>		
	<i>semiglandulosa</i>	Hex River	Tulbagh Dist.
	<i>ciliaris</i>		
250	<i>Mundtii</i> $\beta$	Berg River	Hex River.
251	<i>capillacea</i>	Hex River	Tulbagh Dist.
252	<i>leptogramma</i>		
	<i>Burkei</i> $\beta$	Berg River	Hex River
253	<i>pardalis</i>	Hex R. (correct)	Hex River.
255	<i>ciliaris</i>	Berg and Hex Rivers	Hex River.
	<i>Mundtii</i>		
—	<i>Meisneri</i>		
	<i>cana</i>	Hex River	Tulbagh Dist.

JOHANN FRANCIS DRÈGE made a fairly large collection of *Oxalis* between 1826 and 1834 and his specimens were widely distributed to European herbaria. There is no good representative set of his plants in South Africa, though some of them are to be found in the National Herbarium, Pretoria, the South African Museum, Cape Town, and a few in the Bolus Herbarium. All these sets, usually single plants, are in a terribly poor state and they probably consist of "remains" after the better specimens had been issued.

Many of his plants were given manuscript names which were listed by Meyer in *Zwei Pfl. Doc. von Drège* (1843), but the new species were first described by Sonder. (See Part II, Previous systematic work and Part V, Synonymy.)

His tickets leave much to be desired, often showing only a number or a manuscript name. It is, however, usually possible to trace their

\*The false locality given for *O. Zeyheri* has led to its confusion with *O. amblyodonta* Salter, which occurs in the Tulbagh District, near the Little Berg River.



localities by reference to Meyer's work. Only seven of the species he collected now stand to his credit as new and I have seen *co-types* of all of these except the mysterious heterophyllous *O. ligulata*, which has not been re-discovered.

FREDERICH RICHARD RUDOLF SCHLECHTER, a commercial collector, was in South Africa from 1891 to 1897. He collected a large number of specimens of *Oxalis*, sets which were acquired by most of the principal herbaria both in this country and in Europe, though apparently none of these sets is absolutely complete. His specimens are poor and carelessly preserved and he often neglected to obtain bulbs.

The localities given for his *Oxalis* appear to be generally reliable, with the exception of certain plants said to be from Piquenier's Kloof, now known as Grey's Pass (e.g. *O. macra*, *O. luteola* var. *minor* and *O. disticha*), which occur near the road on the plains some 5 miles to the south of the Pass, where the habitat conditions are quite different.

Schlechter described several species of his own collecting. (See Part II, Previous systematic work.)

DR. F. BACHMANN collected mostly in the vicinity of Hopefield in the Malmesbury Div. between 1883 and 1887 and the majority of his specimens seem to have been sent to Berlin. He is only mentioned owing to some unexplained errors in the numbering of his tickets. Each of those in the Bolus Herbarium bears a number less by 800 than those of similar sets at Berlin (e.g. *O. lateriflora* at Berlin is numbered 1810, but in the Bolus Herbarium 1010).

Of later collectors little need be said. The specimens of Dr. H. Bolus, Dr. L. Bolus, Mr. Frank Bolus, Dr. Marloth, Dr. E. E. Galpin and Mr. N. S. Pillans are most valuable because the bulbs have usually been obtained and the localities are scrupulously correct.

Copious collections have been made in recent years by Dr. C. L. Leipoldt and though this collector has several new species and varieties to his credit and has always collected bulbs, it is very much to be regretted that the drying of the specimens leaves much to be desired and that the localities given are in many cases quite inaccurate.\*

\*I regret to record that before I was aware of this I was instrumental in distributing a large number of duplicates of these specimens in 1931. The localities recorded on the tickets "Ex Herb. Africanum Bolusianum", numbers 19663 to 19798, which are in my own handwriting, are unfortunately often incorrect.



#### IV. THE ANALYSIS OF THE SPECIES AND ARRANGEMENT OF THE SECTIONS.

(i) THE ANALYSIS OF THE SPECIES, in which the plants are divided into 24 Groups for convenience in printing, is almost entirely artificial and intended purely as a means of identification of the species, but the species themselves are arranged in more natural Sections as explained in part (ii).

The main distinctive division used in this Analysis, after elimination of the § Cernuae, with umbellate flowers, is that between the so-called acaulescent (stemless) species and those with the stem exserted above ground (caulescent), as, while it has no exact relationship to the actual affinities of the plants, it seems to involve the fewest exceptions. The most obvious characters have been used and, owing to the great variability of many of the species, it has been necessary to place a number of them in two or more of the Groups. Though bulb and filament characters have necessarily been employed to some extent, these distinctions have been relegated to a secondary place wherever possible, but the key has been drawn up on the assumption that the worker has all the necessary data. It is quite impossible to provide a means of identifying imperfect herbarium specimens and, indeed, in this genus it is often very difficult to ascertain all the important floral characters from dried specimens.

(ii) THE SECTIONS.—In Pfrsch-Ox. (pp. 295-389) the sectioning is founded mainly on the number and shape of the leaflets and to some extent the colour of the flowers, no allowance being made for the frequent variations in these characters and other key distinctions used therein have been found unreliable. The arrangement of the species by such an artificial key has had the effect of spreading close affinities, varieties and even the same species itself under different synonyms over various sections of the work\* and it is obvious that most of the named Sections, Sub-sections, etc., as defined therein must be discarded or revised.

An attempt has been made here to arrange the species at least more in relation to their natural affinities than has been done hitherto. The use of named Sections, etc., is undoubtedly convenient for reference and I have followed this custom, but in so large a genus, where the possible taxonomic characters are combined in an almost infinite number of ways, although a good proportion of the species do fall into groups, it is not possible to arrange all of them in really natural and compact Sections.

\*Many of these are now brought together in the process of drastic amalgamation or "sinking".

A separate Explanatory Key is given to the Sections and Sub-sections employed here. Some of those used by previous authors are retained, but since they have hitherto included species of widely different affinity, they have now been employed in a more restricted sense. Others have been given new names. The main characteristics of each of these divisions are shortly defined and exceptions are mentioned.

It seems to be generally accepted that the primitive type in the genus is that with an umbellate inflorescence (§ Cernuae) in which the seeds are all endospermous, those with the single-flowered peduncle, many of which have exendospermous seeds, having evolved by reduction.

In the first six Sections, A to F (comprising 82 species) the seeds are more or less endospermous and in the remaining five, G to K (119 species) entirely without endosperm. (See Part XI, Notes on the Seeds and their Germination.)

Such species as *O. copiosa* and *O. anomala* in which the peduncle bears either one or two flowers, show a gradual merging into the unifloral Sections and I am of opinion that many of those species in which the pair of bracts is opposite and set at a second or upper articulation on the peduncle (§ Oppositae) are most nearly related to § Cernuae. In most of the species in this Section the whole peduncle is not bent downwards after pollination of the flower but remains erect as in § Cernuae, the reflex movement taking place, though not always abruptly, at or near the upper articulation. The seeds, too, are all endospermous. A number of the unifloral species show a further gradual transition. (See Part XII, (vi) Peduncle.)

*O. psilopoda* is, as far as is known, always unifloral, but its bulb and general structure show that it is very closely related to the Sub-section Stellatae of § Cernuae. *O. lanata*, with similar opposite bracts, sometimes, but very rarely, produces a second flower.

In such Sections as Sagittatae, Campanulatae, Pardales and Crassulae the species have distinct and well-marked affinity, as also to a less extent do those in Sections Oppositae, Sessiliflorae, <sup>21, 19, 28</sup> Xanthotrichae, Lineares and Foveolatae. Glandulosae and Multifoliolatae are more artificial, while it is to be feared that the Section Latifoliolatae forms to some extent the inevitable depositing ground for small groups or individuals with broad leaflets and exendospermous seeds which are not by any means all of close affinity. A few species which are unknown to me and insufficiently described, have been placed at the end.

The possibility of classifying the species by the nature of the bulbs is alluded to in Part XII, (i) The Bulb and system of vegetative reproduction.

## V. SYNONYMY.

The synonymy usually follow after the valid name and place of publication of the species and varieties, but where these have been divided up into Forms (A, B, C, &c.) they are cited where they are applicable. To save space I have not referred to the works in which these synonyms were published, this information being readily obtainable from the Kew Index if required.

The synonymy is not entirely complete. All the species of the well-known *Oxalis* workers are included, but there remain a small number, published by early authors in literature to which I have not had access. These casually named odds and ends are not of the least practical importance and I do not consider that any purpose would be served in even listing them with their supposed, often doubtful identities.

It has previously been the custom to cite as synonyms all the invalid names applied by Meyer to Drège's plants,\* often the only source of identity on the tickets accompanying the specimens, and also all the names applied, through misidentification, by Ecklon and Zeyher in Enum. Plant. I. These cannot, by the rules of nomenclature, be considered synonyms, but they have been mentioned in the citation of the specimens since they are sometimes of value for actual identification and they have been included in the index with an asterisk.

The synonyms which arose from the invalid reversion to the pre-Linnean genus *Acetosella* (Moehr.) O. Kuntze, published in Rev. Gen. I (1891) by O. Kuntze, have also been omitted, except in the case of *Acetosella Sonderiana*, where the specific name has been adopted in the place of the inadmissible *minima* of Sonder.

## VI. HETEROPHYLLY.

Heterophylly in *Oxalis* is a subject about which little is known and it appears that a detailed study of each species from the seedling stage onwards is necessary before any theories can be formed.

I propose here merely to set down such facts as have come under my observation in order that they may be available to those who have, in the future, an opportunity of really investigating the question.

## (i) VARIATION IN THE NUMBER OF LEAFLETS.

In several species in Section J, *Angustatae* varieties occur with 3, 5 or even 7 leaflets, the number of leaflets in the typical form depending

\*This does not apply, of course, to those which have been adopted and validly described by later authors.

merely on priority in naming. Thus *O. variifolia* (5-fol.) and *O. capillacea* (5—9-fol.) both have 3-foliate varieties, while *O. reclinata* and *O. obtusa* (3-fol.) have 5-foliate varieties and *O. polyphylla* varieties with both 5 and 7 leaflets. In all these species a few 3-foliate juvenile leaves are found on the mature plants which normally bear 5 or more leaflets. It is probable that *O. quinata* is only a 5-foliate variety of *O. linearis*, but it is impossible to judge with certainty from the poor dried specimens which I have seen.

In some species in the § Crassulae there is a progressive increase in the number of leaflets with age and in such species as *O. fabaeifolia* (Form B, *asinina*) and *O. flava* (Form G, ? *O. lupinifolia*) the bulbils produce unifoliate leaves in the first year, later bifoliate and eventually mature 3—5-foliate leaves, leaves with varying numbers of leaflets usually occurring on the same plant. (See Introduction to § Crassulae.)

In the case of *O. Nortieri*, which seems to be unique in this respect, the leaf development is quite different. The bulbils produce trifoliate leaves with widely rotund leaflets in the first season, in the second at first trifoliate and later unifoliate leaves and in the third and subsequent seasons all unifoliate elliptical or obovate leaves.

From these two cases it will be seen that both increase and reduction in the number of leaflets may take place.

#### (ii) VARIATION IN THE SHAPE OF THE LEAFLETS.

In *O. heterophylla*, a complex group-species with bifurcate leaflets, in the more or less typical forms (including *O. caledonica*) the numerous stem leaves are smaller and less deeply lobed, with proportionately broader lobes and nearly obcordate, but the group consists of many micro-varieties and this leaf-variation is not found in all the forms. In the stemless Form B, the bulbils at first produce obcordate leaflets.

An old bulb of *O. densa* (with bifurcate leaflets) has produced a few obcordate juvenile leaflets in cultivation.

Study of herbarium specimens of the polymorphous *O. Smithiana* reveals marked heterophylly in some specimens. In this species the depth of the lobing of the leaflets and the shape of the lobes are very variable. Some are divided almost to the base, with narrow-linear lobes, others only to about the middle with widely divergent obovate lobes and various grades of intermediates occur. A few specimens, however, are found having both extreme forms of leaf and others with progressive lengthening and narrowing of the lobes.

In *O. obtusa*, perhaps the most widely distributed and complex group-species of all, although heterophylly is common, the typical form and certainly many of the others show no leaf-variation. In many of the



northern variants, however, the first leaves are obcordate and the later gradually narrow to oblong-cuneate or linear. In many sets of specimens of my own collecting there are often, in the same set, some plants with both kinds of leaflets, others with obcordate leaflets only and again some with linear leaflets only, while intermediate shapes often occur. The 5-foliolate form (*O. atrata*) shows this heterophylly in a marked degree, but in this case some of the bulbs have retained the juvenile (obcordate) leaflet-form entirely in cultivation. Those forms in which the leaflets are bilobed certainly sometimes produce obcordate juvenile leaves. On the other hand there are apparently forms which, in cultivation, have never produced narrow leaflets.

At the time when I was collecting all these specimens I was unfortunately not fully alive to the difficulties which this group would present and I did not make any field observations. Since the *obtusa* group is probably the most prolific and most variable in South Africa, I am of opinion that its problems (like those of many other species in the genus) can only be solved after long and laborious study of all the forms in the field and in cultivation.

Somewhat similar heterophylly occurs in *O. Annae* in which the leaflets progress from rotund to cuneate-sub-bilobed, different forms of leaflets often occurring on the same plant. *O. bella* is only a form of this species in which the variation is less marked.

In several species which normally have more or less rotund leaflets, forms with oblong leaflets occur, either in separate colonies or colonies growing near to the normal form. *O. laburnifolia*, in which, in the wild state, the leaflets are narrow-oblong, narrower than those depicted by Jacquin (tab. 28), is an extreme form of a chain of variants from the commoner yellow-flowered form with broad leaflets. (See *O. purpurea* L., Form E (i), (ii) and (iii). *O. ambigua* Form B (*O. rubro-flava*), also with much narrower leaflets than are shown in Jacquin's figure (tab. 50), is a similar variant from a commoner form with rotund leaflets and also with yellow flowers. *O. purpurea* Form L, with cuneate-rhomboid leaflets and Form K, with subrotund leaflets provide a similar instance and *O. leucotricha*, with almost ligulate leaflets,\* is a parallel variation from the normal *O. pulchella*, var. *glauca*. In all these cases the juvenile leaflets produced by the bulbil in the first season are more or less rotund and there is a progressive lengthening of the later leaflets. Where two such distinct forms grow in association or in sufficiently close proximity for cross-pollination to take place, a careful search has been made for apparent hybrids, but no sign of them has been found.

\* Zeyher's type specimens are abnormally small.

*O. laburnifolia*  
should be re-  
instated as a  
species See  
p 140 and  
End. papers.



These observations, scanty as they are, at least go to prove that the number and shape of the leaflets are characters which must be used with caution in drawing up keys to the species and, indeed, in estimating the limits of a species itself.

## VII. HETEROSTYLY AND POLLINATION.

All the native South African *Oxalis* are probably trimorphic, though all the stylar lengths have not actually been observed in some of the rarer species.

It is well known from the experiments in artificial pollination carried out by Hildebrand, Darwin and Arechavaleta that the three forms of styles are normally pollinated only from the stamens of corresponding length and that the pollen grains from the three sets of stamens differ in size. Their experiments, however, did show that successful pollination between different lengths of stamen and style was possible, though rare.

Though I have had no opportunity of making experiments on these lines, the following observations have been made in respect of absence of fertilisation in colonies consisting of only one stylar length.

(i) One plant of the typical yellow-flowered form of *O. flava* appeared in the nursery garden at Kirstenbosch some years ago, possibly through the accidental introduction of a bulb or bulbil. This plant was of the medio-stylar form and increased rapidly by vegetative reproduction. It was from this source that large numbers of plants have been taken for decorative bedding out in the main garden, but a large compact bed of them remains in the nursery. These plants, many thousands, are one clone, isolated from any chance of pollination from the other stylar forms and, after repeated searches, have never been found to produce seeds.

(ii) Of the large number of species which have been grown in cultivation, a great many, owing to unfortunate chance selection of the bulbs or to the fact that only one bulb was planted, are only represented in one stylar form and these have never produced seeds.

(iii) In the Cape Peninsula *O. caprina*, which is a common weed of cultivation, spreads rapidly through the constant distribution of the bulbils in working the soil. It occurs also frequently in hedges and ditches, but as a really wild plant it is comparatively rare. All these plants are of the short stylar form and do not produce seeds, though where apparently identical plants occur outside the Peninsula, e.g. at Caledon and to the eastward, all three stylar forms are found and seeds are produced freely.

It seems possible that this species was introduced in the Cape Peninsula long ago as a clone, but it may be that it is a slight variant from the more easterly form, which, owing to isolation, developed this singular character.

(iv) The common species *O. pes caprae*, also often a weed of cultivation, is frequently found in isolated colonies where all the plants are of one stylar length. These colonies are probably clones originating from a chance bulbil and have spread by vegetative reproduction. Here again no seeds are produced, though they occur abundantly in mixed colonies.

### VIII. HYBRIDISATION.

I have never observed hybridisation in *Oxalis* in the wild state, except possibly between two slightly differing forms of the same species and even that very rarely. Two rather similar presumed, or almost certain hybrid plants have, however, appeared in the nursery at the National Botanical Gardens at Kirstenbosch between *O. macra* Schltr.  $\times$  *O. Creaseyi* Salter, which were planted in adjoining rows and both seeded so freely that the two species became intermingled. The two parents show no morphological affinity and are from widely different localities, *O. macra* only occurring in the plains in the Piquetberg Division and *O. Creaseyi* in the Kamiesberg Mts., over 200 miles away. (For more detailed account of these hybrids, see Sp. 139 A.)

Certain artificial hybrids are said to have been produced in cultivation by Hildebrand, and though I have not had access to his original works, a summary of his experiments is given in Pfrsch-Oxal., pp. 27-28, where the author makes the very significant statement that Hildebrand's observations suffer from the defect of incorrect systematic determination of the species.

I am, personally, only able to comment with certainty on those two cases in which South African species are involved, viz. *O. rubella* Jacq.  $\times$  *O. hirta* L., two slightly differing forms of the same species, and *O. Piottae*\* Colla  $\times$  *O. obtusa* Jacq., which are also conspecific.

As regards the non-South African species, I note that in the case of the hybrid *O. rusciformis* Mikan  $\times$  *O. fruticosa* Raddi, the latter is placed as a synonym of the former in Pfrsch-Oxal. In the cases of *O. tetraphylla* Cav.  $\times$  *O. latifolia* H.B.K. and *O. lasiopetala* Zucc.  $\times$  *O. articulata* Savign, it seems again open to question whether Hildebrand was dealing with different forms of the same species. *O. Deppei* Lodd., which was said to hybridise with *O. Tweediana*, is, according to Darwin,

\**O. Piottae* Colla has been erroneously cited as a synonym of *O. punctata* L.f. (See Kew Index), but I cannot trace the original author of this misidentification.

not definitely known to be heterostyled, the short-stylar form, growing by itself, yielding seed.\* *O. Tweediana* seems to be some unpublished species.

Hildebrand observes that *O. pes caprae* L. (*O. cernua* Th.) and *O. compressa*, two closely allied species, will not cross, a fact borne out by my own observation of several very large mixed colonies of these two species.

The great significance which natural hybridisation (so common in many South African genera) might have as a partial explanation in connection with the complexity of the genus, has been constantly in my mind, and, although I have searched diligently over a number of years, I have failed to find any satisfactory evidence of it.

In one colony of *O. pes caprae*, where many of the plants had some of the characteristics of its very doubtful variety *sericea*, there were some apparently intermediate forms, but although I have upheld var. *sericea* on account of its extreme form, I am very doubtful whether its separation as a variety can really be justified.

Between two adjoining colonies of the hirsute forms of *O. purpurea* (Form K, with more or less rotund leaflets and Form L, with cuneate-rhomboid leaflets), I found one specimen only with somewhat intermediate leaflets, which might be of hybrid origin, but the two Forms are identical except for the shape of the adult leaflets, both of them producing rotund juvenile leaflets from the bulbil in the first season. None of the other leaflet-variants referred to in Part VI Heterophylly, show any sign of hybridisation when they grow in sufficiently close association for cross-pollination to take place.

In colonies of *O. purpurea* and *O. glabra*, in which both red- and white-flowered forms grow in association, a few plants with more or less pinkish flowers are usually found. In one colony of *O. tenella*, where the rare yellow-flowered form was growing with the white, a number of plants occurred with cream-coloured flowers of varying shades. These intermediates suggest cross-pollination, but no other such instances have been observed.

It is not that *Oxalis* in the field are so segregated that they have little chance of cross-pollination. I once counted 10 species (8 in flower) on a plot of ground no larger than a tennis court. Further, where I have had a very large number of species under cultivation in the closest proximity in the open at the National Botanic Gardens at Kirstenbosch, only one instance, viz., that between *O. macra* and *O. Creaseyi*, already mentioned, has been observed.

\*Darwin; Different Forms of Flowers, p. 179.

## IX. TERATOLOGY.

Petalomania, or doubling of the flowers, has been observed by me in the species *O. compressa*, *depressa*, *exserta*, *glabra*, *hirta* and Form E. (*rubella*), *luteola*, *pes caprae*, *Pocockiae*, *obliquifolia* and *obtusa*, and it is also said to occur in *O. imbricata* and *semiloba*.\* It is by no means common in nature, and the frequent presence of such specimens in herbaria is due to a natural inclination to collect rare or abnormal forms. No cases of the spontaneous petalomania, owing to changed conditions, referred to in Pfrsch-Oxal., p. 32, have been observed among the many species which I have had under cultivation. As far as is known, such plants never revert to the normal single-flowered form.

Those doubled flowers, which have been examined, exhibit petalomania of the following kind. The flowering axis is elongated, with a normal calyx at the base, followed by numerous whorls of petals, usually 5-nate, the lower mostly shortly united at the base, but occasionally free. Higher on the axis the petals are progressively smaller, becoming completely separated and sometimes rather unequal in size, the uppermost being minute and almost colourless. A flower of *O. pes caprae*, var. *sericea*, was found to have 70 petals in all. There are no traces of stamens or carpels.

An interesting instance of petalomania has been observed in a completely isolated colony of *O. Pocockiae*, growing in crevices or on ledges of the cliffs above Partridge Point in the Cape Peninsula, where all the flowers in the colony were double. Since such plants are sterile and can only propagate vegetatively, their occurrence in a number of cliff pockets is difficult to understand. It is, however, known that this species, which has broadly winged bulbs, sometimes produces quantities of winged aerial bulbils in the axils of the rosette of basal leaves, certainly capable of being wind borne. This is a possible explanation of the distribution of these plants along the cliffs. There is only one other somewhat doubtful record of this species (with single flowers) in the Cape Peninsula, about 20 miles distant, and it would be interesting to know the origin of this double-flowered colony.

Other instances of abnormality which have come under my notice are:—

(i) A distortion of the umbel of flowers and multiplication of the bracts which is sometimes found in *O. pes caprae*, an aberration in which the cymose structure of the umbel is revealed by the elongation of the internodes. This by no means rare abnormality gave rise to the species *O. kuibisensis* R. Knuth, from a garden at Kuibis in S.-W. Africa.

\*Pfrsch-Oxal., p. 32.



(ii) A set of specimens of *O. purpurea*, Form G, from Namaqualand, were all found to be entirely devoid of stamens, ovary and styles, though the petals and sepals were normal.



FIG. 1. *Oxalis lanata* L.f. with virescent flowers. 1. Petal  $\times 4$ . 2. Androecium  $\times 8$ . 3. Gynaecium  $\times 8$ . 4. Plant  $\times 2$ . 5. Leaf (under side)  $\times 2$ . 6 and 7. Sepals  $\times 4$ . (Salter 6163.)

(iii) Virescence in the flowers of *O. lanata* occurs in a colony in a pine wood near the herbarium at Kirstenbosch, the only known locality.



The 5 petals and sepals are free and leaf-like and all the flowers are sterile, the styles being without stigmas although the stamens are normal. Both the typical white form of *O. lanata* and its variety *rosea* grow in the vicinity and it is possible that this freak may have arisen as the result of hybridisation. (Fig. 1.)

(iv) The enlargement and spatulate shape of one or two of the sepals, shown in Jacquin's figure of *O. flabellifolia*, tab. 74 (*O. flava*, Form D), though fairly common in that particular Form, is not constant and cannot be considered a specific character. Very similar abnormal sepals have been observed in *O. fabaeifolia* and in colonies of the white-flowered *O. purpurea*, Form H, occurring in Van Rhyn's Dorp Division.

\* *O. undulata*  
Jacq. tab. 64

(v) Abnormal forking of the peduncle near the top, with the consequent production of two flowers, has been observed in one specimen of *O. flava*. The peduncle is without the characteristic upper articulation and opposite bracts of the § *Oppositae*.

(vi) All the specimens from one colony of *O. purpurea*, Form D (*O. stictophylla*) were found to have large spatulate or obovate foliaceous bracts on the peduncle (S. 676A). As this peculiarity was not noticed at the time of collecting, it is not known whether the whole colony was similarly affected.

## X. EPHARMONIC VARIATION.

The genus is particularly prone to epharmonic variation, especially in the species which occur in the more arid regions where the favourability of the season or otherwise has a marked effect on the general size of all parts of the plant,\* as will constantly be seen from the wide range of measurements given in the descriptions. Most of Zeyher's specimens, particularly those collected on his journeys to Namaqualand, are starved and unnaturally small, having evidently been collected in a dry season.

Marked etiolation occurs in shade, where, in the case of the species with narrow leaflets, the leaflets almost invariably tend to broaden. This broadening of the leaflets is particularly noticeable in some of Jacquin's figures of *Oxalis* which were grown under unnatural conditions at Vienna (e.g. *O. ciliaris*, t. 30, *O. gracilis*, t. 33), the former a common species which has for this reason not been recognised by previous workers and has been renamed several times. (See synonyms.) Several of Jacquin's figures show signs of etiolated weakening, e.g. *O. reclinata*, t. 34, normally an erect plant and very unfortunately named. (See Plates VII and IX, opp. pp. 226ff, 304.)

In the dryer regions, particularly among the caulescent species, though

\*See Part XII (viii) Corolla.

the majority of the plants grow in the open and are thus of normal height, a number are nearly always found growing up through the characteristic low scattered shrublets and produce stems of many times the usual length. The explosively ejected seeds are no doubt often arrested in flight by such shrublets and the slight moisture at their roots is particularly favourable to germination.

Among the large number of species from dry regions grown in the open at the National Botanic Gardens at Kirstenbosch, where there is a comparatively large rainfall, I have found that although in some cases they are a little more luxuriant, they have otherwise, with a few exceptions, remained very near the normal.

#### XI. NOTES ON THE SEEDS AND THEIR GERMINATION.

Although probably the majority of *Oxalis* throughout the world produce endospermous seeds and, indeed, the earlier definitions of the family Oxalidaceae give this as a characteristic, in more than half of the South African species the seeds are entirely without endosperm. The existence of exendospermous seeds in the genus was first noticed by Hildebrand in cultivated plants,\* but little attention seems to have been paid to this discovery and the fact appears to have escaped the notice of most botanists, for I am unaware of any further reference to the matter in literature.

My own attention was first drawn to their occurrence by Mr. S. Garside, who noticed the absence of endosperm when we were examining the seed ejection in living plants of *O. disticha* in 1933,† but I did not, until several years later, realise the important bearing which the two kinds of seeds might have on the systematic classification of the genus.

Out of 201 species (I exclude 7 which are imperfectly known) I have been able to examine the seeds of 162, leaving 39 unexamined. The affinities of the latter, however, indicate almost certainly the nature of their seeds and, on this assumption, it may be said that 82 have endospermous seeds and 119 exendospermous.

The fact that the species in the § Cernuae and the Sections most closely related thereto have endospermous seeds tends to confirm that these species are of the more primitive type.

The structure of the seed cannot be correlated in any way with the climatic conditions under which the species grow, but in general, those with broad leaflets show a marked tendency to produce endospermous seeds and those with narrow leaflets exendospermous. It may be of

\*Hildebrand, *Lebensverhältnisse der Oxalis-Arten*, 1884.

†See Proceedings of the Linnean Society 148 (1935-6), Part 2, p. 79. A Botanical Tour of the Cape, by S. Garside.

interest to record that having decided upon my preliminary arrangement of the species and their grouping into Sections by other characters, I found later, on examination of the seeds for possible group characters, that only four species, all of doubtful affinity, had to be changed to other Sections. Classification according to seed characters therefore coincided almost completely with my classification based on general morphology and floral structure.

Although the endospermous seeds show a considerable amount of variation in the thickness of the endosperm and the degree of maturity of the embryo, there can be drawn a distinct line of demarcation between the two seed types.

The exendospermous seeds are soft and greenish, due to the green embryo within, and after ejection by the elastic whitish outer testa or seed coat, the inner integument consists merely of a smooth colourless delicate membranous sheath, so thin that it often ruptures irregularly and falls away as the embryo it covers is ejected. The embryo, with its two fleshy cotyledons and plumule, is fully developed and is then ready for immediate germination and in the presence of moisture the cotyledons diverge and the embryo at once becomes a growing plant. My own experiments have shown that such seed, if kept quite dry, lose their power of germination after about three days, but no exact observations have been made. The loss of germinating power after a short period is usual in seeds with embryos containing chlorophyll.

The endospermous seeds are generally of smaller size and the persistent tissues covering the endosperm are hard and brown, with a more or less rugose surface, the colour and proportionate size of the embryo to the ripe seed and the thickness of the endosperm varying considerably in different species. Since most of the seeds examined were taken from dried specimens, i.e. before their ejection from the capsule, some of them at least were not quite ripe, and I have therefore not systematically recorded the size of the embryos, which in the great majority of such seeds are colourless and the plumule is undeveloped.

These are relatively slow-germinating seeds. There is, however, a further advance towards the exendospermous type. In *O. Bowiei*, *O. dichotoma* and *O. Knuthiana* in § Cernuae and in *O. imbricata*, *O. ioeides* and *O. psilopoda* (all closely allied), *O. strigosa* and *O. extensa* in § Oppositae, the embryo is already green and nearly fills the seed at maturity; the layer of endosperm covering it is consequently much thinner, but the plumule remains undeveloped. Of these, *O. Bowiei* germinated in less than 48 hours\* and *O. imbricata* in about 72 hours. These, there-

\*My grateful thanks are due to Dr. M. A. Pocock for collecting seeds of this species at Grahamstown and timing their germination.

✕ See last end-paper.

Seeds sent to Cambridge  
in 1949.

fore, although definitely endospermous, show, both in structure and behaviour, a distinct tendency to a transition to the exendospermous type.

The white fleshy outer integument of the seed, which acts as an ejector, was formerly erroneously described as an aril. Its true morphology, together with the process of ejection, has, however, been correctly described by F. Overbeck, *Jahrb. f. Wiss. Bot.* 62 (1923) 258, who states that "at maturity, the outer integument forms a succulent layer, covered with an extremely thick elastic cuticle, which splits longitudinally along the *adaxial* side of the seed and becomes suddenly everted, throwing out the inner portion of the seed, which is covered with a hard protective layer of cells derived from the inner integument." His observations were made from endospermous seeds, but the action is the same in all. It is extremely curious that the split should take place on the adaxial side of the seed, so that its inner portion is thrown forcibly against the axis of the capsule and rebounds from it.

The process of eversion is, of course, far too rapid to be followed by the eye. I have found, however, that if slightly unripe capsules are obtained and, after moistening with alcohol, coaxed with a dissecting needle, the eversion of the outer integument of the seed will sometimes take place comparatively slowly, and I am able to confirm Overbeck's statement as regards the adaxial splitting. The experiment seems to depend on the seed being in exactly the right state of maturation, and many failures are to be expected before a satisfactory observation is achieved.

#### THE FIRST FOLIAGE LEAF.

As far as I know the seedling rarely produces more than one leaf in the first season, but this leaf may be quite unlike that of the mature plant. The following are particulars of the few seeds (all exendospermous) which I have seen germinating:—

Species.	Seedling. First foliage leaf.	Mature plant. Normal leaf.
<i>hirta</i>	5-foliate, petiolate	3-foliate, sessile.
<i>cathara</i>	Unifoliate	Multifoliate.
<i>fabaeifolia</i> Form B.	Unifoliate	1—5-foliate, the number increasing with age.
<i>lupinifolia</i>	Unifoliate	1—5-foliate, the number increasing with age.
<i>Creasseyi</i>	3—4—5-foliate, in about equal numbers.	3-foliate.
<i>heidelbergensis</i>	5—7-foliate	3-foliate.
<i>capillacea</i>	3—5-foliate	5—9-foliate.
<i>ciliaris</i> Form C.	5-foliate.	3-foliate.
<i>polyphylla</i>	3-foliate	5-foliate.
var. <i>pentaphylla</i>		



In the following exendospermous species, the first foliage leaf bears the same number of leaflets as the mature plant: *macra*, *namaquana*, *glabra*, *versicolor*, *pardalis*, *tenuipes* 3; *reclinata*, var. *quinata* 5; *Salteri* 1.

Even from the above table it may be seen that both increase and reduction can take place as the plant matures.

In all the species with endospermous seeds, the mature leaflets are 3-foliolate and in those few which I have seen germinate, the first foliage leaf is also 3-foliolate and the cotyledons petiolate.

## XII. NOTES ON THE PRINCIPAL ORGANS, WITH REMARKS ON THEIR VARIATION AND RELIABILITY IN SYSTEMATY.

- (i) The Bulb and System of Vegetative Reproduction (p. 29).
- (ii) The Rhizome (p. 36).
- (iii) The Stem (p. 37).
- (iv) The Petiole (p. 37).
- (v) The Leaflets (p. 38).
- (vi) The Peduncle (p. 40).
- (vii) The Sepals (p. 41).
- (viii) The Corolla (p. 42).
- (ix) The Stamens (p. 43).
- (x) The Ovary and Capsule (p. 44).
- (xi) The Styles (p. 45).
- (xii) The Hairs (p. 46).

### (i) THE BULB AND SYSTEM OF VEGETATIVE REPRODUCTION.

The bulb is one of the most important characters and no set of specimens can be considered complete unless it is represented. It has hitherto been greatly neglected and, out of 204 South African species described in Pfrsch-Oxal., this all-important organ is only mentioned, usually perfunctorily, in 78 cases, and in many of these only from Jacquin's rather doubtful illustrations.\*

Whether the species could ultimately be classified by the bulbs and system of vegetative reproduction is perhaps doubtful until more knowledge of this complex subject has been acquired, but they undoubtedly play a most important part in the determination of the species and affinities. As an example, the species *O. livida*, *O. lateriflora* and *O. dentata*, each with an entirely different subterranean organisa-

\*Some of the bulbs figured by Jacquin are only bulbils, others have lost their outer tunics and I regret to say that in some cases there is evidence of artistic licence. Two of them are figured upside down.



tion, cannot be distinguished with certainty by the above-ground characters. (See Journ. of S.A. Bot., VI (1940), 13 and Plates II, III and IV, opp. pp. 82, 84, 85.)

The very different bulbs in the remarkably similar plants *O. crispula* and *O. stenoptera* var. *undulata* provided the clue to their widely different affinities.

The size and shape of the bulbs and the nature of the tunics afford the greatest variety, but the majority are ovoid or lanceolate in outline. In *O. simplex* it never exceeds 5 mm. in length and in others it is little larger, while in such species as *O. strigosa* and *O. foveolata* it may attain several inches in length.

The practical difficulties presented by the study of this subject, at any rate on a large scale, are much greater than would be supposed, for many of the bulbs descend to a great depth before producing flowering plants and are by no means easy to obtain. Owing to the thread-like nature of the lower part of the rhizome, the greatest care and delicacy must be exercised in excavating them. I have spent over an hour in obtaining even one bulb, and in one case failed altogether. It is these deep-seated bulbs that present the chief problems, and to investigate their development in the field, after the flowering season when the reproductive system is in operation, would be a long and laborious task.

If such investigations are to be carried out with cultivated plants in the open, much space would be required, for the ground must be disturbed over a large area around them. In ordinary flower pots such species make an abortive attempt to form their new bulbs in the crocks at the bottom and do not flower. This difficulty might be overcome by special deep receptacles which could be opened at the side, but several bulbs would have to be first obtained.

There are several ways in which the bulbs reach their requisite depth. In many species, particularly in § *Angustatae*, sub-sections *Sessilifoliae* and *Lineares*, having done so in the seedling stage in the first year, they remain stationary. In this case the bulbs may live to a considerable age, forming new nutritive scales within the old bulb over and over again. The age of the bulb can be judged roughly by counting the alternate layers of thin protective and old shrivelled nutritive scales. A fairly large bulb of *O. polyphylla* was found to have 30 such alternate layers, showing that its age was at least 30 years. This also takes place in many of the deep-seated bulbs when they have reached their requisite depth. Bulbs of this type sometimes produce more than one set of nutritive scales within the original outer tunics and so two or more rhizomes arise from one composite bulb.

In a large number of species, however, the bulbs reach a greater

depth by means of a fleshy whitish contractile root which emerges from the base of the bulb. This root gradually contracts and drags the new nutritive scales formed within the bulb out of their original casing, downwards, or in the apparently isolated case of *O. dentata*, sideways, and consequently the new bulb is formed in a different position.\* This action is explained with a figure in the case of *O. imbricata*, var. *cuneifolia*. (Fig. 8.) The mechanism of the contraction of the fleshy root in *O. incarnata* is discussed in two papers by D. Thoday and A. J. Davey.†

In most of the species in § Crassulæ, e.g. *O. flava*, *O. fabaefolia*, *O. namaquana*, *O. pulvinata*, *O. Louisae*, *O. Salteri*, in *O. tomentosa* (Subsect. Multifoliolatae), *O. suavis* (§ Latifoliolatae) and possibly also in some species in other Sections in which the bulbs are deep-seated but do not produce a contractile root, the method of attaining the requisite depth is quite different. A long specialised root‡ emerges from the base of the bulbil or young bulb which has not reached flowering maturity. The cortex of this root soon breaks away from the inner core (*stele*) and forms a loose tubular easily-broken sheath and the new bulb is formed laterally on the lower part of the core. Examination of such roots in *O. flava* and *O. namaquana* shows that the free inner core continues to lengthen inside the cortex, either spirally or bursting through the dry covering.§ The actual point of emergence of the new bulb has not been observed, but even when about half developed, its position is usually several inches above the somewhat fleshy and swollen growing point of the root.

See notes on  
*O. laburnifolia*  
Part II, p. 18 (J.  
S. H. Bot. 1948)  
in end papers

The original young bulb, its nutritive scales exhausted, soon dies off and decays and, if it is broken away, no perceptible junction can be seen between the underground stem (rhizome) above it and the long core, or exposed *stele*, below. The whole finally dies with the withering of the foliage, leaving the new bulb to grow in the following year.

\*Jacquin, who apparently never recognised the function of these contractile roots, refers to them in his Monograph as "*fibrae fusiformes ex bulbis monstrose enascuntur*", citing *O. glandulosa* (tab. 46) as an example. The bulb in this figure is composite (as explained above) and has evidently been planted upside down. This, I believe, also applies in the case of *O. pulchella* (tab. 69), not, however, with a composite bulb. In both cases the subterranean stems (rhizomes) have burst through near the base of the bulb in their effort to reach the surface of the soil and the contractile roots emerge from the top of the bulb as planted.

†The contractile root of *O. incarnata*. Thoday. Ann. of Botany XL, No. CLIX (July, 1926), 572-583. On the mechanism of root contraction in *O. incarnata*. Thoday and Davey. Ibid. XLVI, No. CLXXXIV (Oct., 1932), 993-1005.

‡Jacquin refers to this root as *fibra radicalis*. (Jacq-Oxal, page 3.)

§I think this may be a further extension of the system under which the seedling produces its first bulb laterally on a root descending from the hypocotyl. This root has a similar perishable cortex and shows the same elongation and spiralling of the core.

In a large mature flowering bulb of *O. flava* (typical), lying at a depth of about 40 cm., the alternate layers of protective tunics and exhausted nutritive scales showed its age to be four years.

Two forms (cultivated) in the group-species *O. flava*, one with narrow leaflets from Riversdale Div. and one with the broad leaflets of the *lupinifolia* type from Worcester Div., flower with the bulbs constantly at a shallow depth. These produce similar specialised roots, emerging either from the base of the bulb or from the lower part of the rhizome above it, but running horizontally and not vertically. In these, the bulbs are short lived and new plants are formed some distance from the original parent.

In Forms F. and H. of *O. flava*, the mature bulbs lie at a comparatively shallow depth and do not appear to produce this specialised root, perhaps reaching their requisite depth in the seedling stage. These bulbs have a thick soft somewhat fibrous coating which is formed by the rupturing of the lower part of the successive annual layers of the thin pairs of calyptrate protective tunics. These, together with the exhausted nutritive scales between them, are forced outwards and upwards from year to year by the development of the new living nutritive scales in the interior of the bulb. The tunics only split in their lower part and their apices, overlapping one another, form a more or less conical top to the bulb: in other words the coats become too small in the waist for the growing bulb. A comparatively small bulb of *O. flava*, Form H. (S. 7290), about 1.6 cm. in diam., showed 15 annual layers. I have only seen the bulbs of *O. fabaeifolia* (Form A. typical) when mature. They are also of this fibre-coated kind, but larger and deep-seated. According to Hildebrand,\* however, *O. fabaeifolia* produces the specialised descending root (so general in the § *Crassulae*) in its younger stage. No bulbils have been observed on the rhizomes of such plants. They always grow as individuals, never in tufts, and they appear to multiply by seed only.

At first sight it would appear that such widely differing bulb development might form a basis for taxonomic classification in the group-species *O. flava*, but very much more data are required before this can be attempted. The species is wide-spread and prolific in local variants, in the majority of which, owing to the difficulty of obtaining them, the bulbs have not yet been collected. The specimens which I have placed in Form H. are merely those which I have personally observed as having the shallow fibrous-coated form of bulb, and I can find no other obvious

\*Pflsch-Oxal., p. 12, f. 4 (Hildebrand, Lebensverhältnisse der *Oxalis*-Arten (1884) t. 1).

S 2293

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character upon which to separate them from the typical form. The whole question of the character of the juvenile leaves in this group (see introduction to § Crassulæ) must also be taken into consideration.

In some species the rhizome is coated, at least partially, with a disintegrating tunicaceous cortex or sheath, but, except in the case of *O. Creaseyi*, the process of its formation has not yet been observed.

In *O. Creaseyi* the system of vegetative reproduction is by underground stolons or "droppers" arising both from the rhizome and from near the base of the bulb and differs from that of all other South African *Oxalis* hitherto observed, in that a protective tube is formed for the delicate ascending axis from the new bulbils. The bulbils, once they are formed at the ends of the droppers, are normal in their development and though their life appears to be comparatively short, it is at least two to three years.

Fig. 2 A represents the root system about three months after flowering. Fig. 2 B shows a simple diagram of the vertical structure of a bulb, the parts having been slightly separated. The bulb consists of an ascending axis (rhizome) *r*, bearing on its lower part the now exhausted nutritive scales *n*, *n* of the current year and on its upper part, within the bulb, some very small scales *s*, *s*. Just above the nutritive scales are also a few undeveloped scales, one of which produces, as an axillary structure, the new or next year's bulb *b*: the others produce, each in its axil, a dropper *d*, *d*.

Above the old bulb droppers are also produced in the axils of the scales of the rhizome, i.e. on the underground part of the stem between the apex of the bulb and the base of the aerial shoot, as shown in Fig. 2 A. In the illustration of the living plant (Fig. 64) it will be seen that the upper droppers have just commenced to develop.

Each dropper is an axis which descends with the growing apex reversed, forcing down the young white bulbil which forms its apex base-first. The striking peculiarity is that from the nodes of the dropper are produced the calyptrate outer protective scales of the bulbil, one at each node and, with the downward lengthening of the internodes, these scales slip off the apex of the bulbil and are left behind in succession, deeply imbricating one another in the form of a tube (Fig. 2 C). At first the scales are very thin, white and soft, but as they receive independent nutriment from the dropper they become stouter and more leathery, soon turning brown in colour. When it reaches its final position the new bulbil *b* begins to swell rapidly and form a new bulb. The scaly tube *t*, which has now been formed above it, evidently provides a protective channel for the ascending axis which the bulb will subsequently produce, indeed, part of this tube, still attached to the previous



year's dropper, can be seen on the rhizome immediately above the old bulb in Figs. 2 A and 64.

In *O. blastorrhiza* the bulb structure resembles a branched tuber.

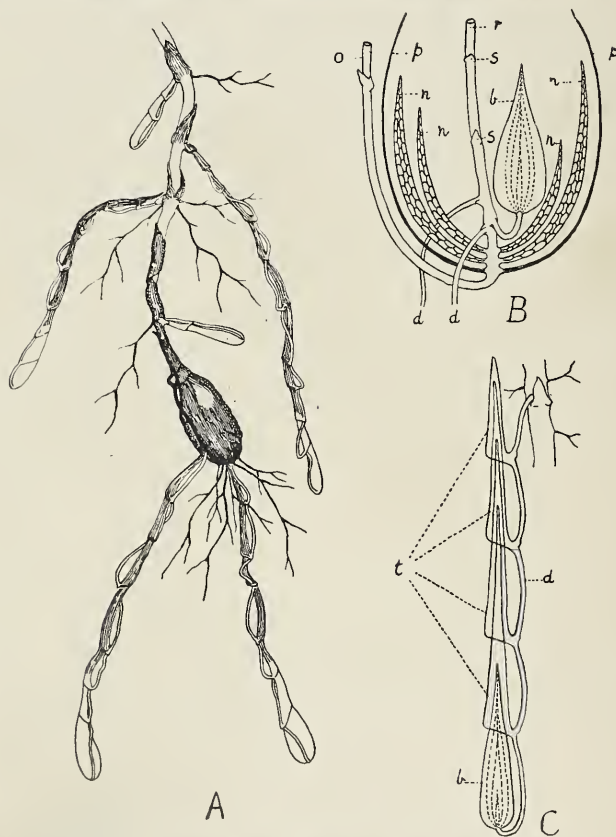


FIG. 2. The system of vegetative reproduction in *Oxalis Creaseyi*, Salter. A. Under-ground structure 1½. B. Diagram of vertical section of the bulb, the parts slightly separated: o. withered dropper; r. current year's rhizome; p.p. layer of thin protective scales; n.n. exhausted nutritive scales of the current year; d.d. droppers; b. following year's bulb; s.s. small scales. C. Diagram showing the formation of the protective tube: d. dropper; b. bulbil; t. the calyptrate scales forming the tube.

The droppers scarcely develop at all and the new bulbs are formed protruding base-first from the old bulb, the new growing axes ascending through its tunics alongside the old dead rhizomes.



In a number of species there is a considerable change in the shape of the bulb with age ; thus, in *O. Louisae*, *O. strigosa*, *O. aurea*, *O. stenoptera*, all with deep-seated bulbs, the younger bulbs are elongate-lanceolate in outline with long apical beaks and the mature bulbs more or less ovoid, but it is only the latter which, having reached their requisite depth, produce flowering plants.

Certainly the majority of the species produce more or less sessile bulbils on the rhizome, but in several, e.g. *O. lateriflora*, *O. glabra*, *O. callosa*, *O. purpurata*, *O. exserta*, *O. ciliaris* and some forms of *O. Eckloniana* they are formed on long lateral horizontal stolons and never close to the rhizome. No bulbils at all have been observed in the case of many of the species in the Sub-section Lineares.

The caulescent *O. incarnata*, *O. heterophylla* and *O. stellata*, var. *montaguensis* and the acaulescent *O. Fergusoniae*, *O. inaequalis*, *O. lichenoides* and *O. Pocockiae* produce aerial bulbils in the leaf axils, but, except perhaps in the case of *O. incarnata*, their occurrence does not appear to be constant. To what extent these ever come to maturity and how the requisite depth in the soil is attained are not known.

See notes on  
*O. laburnifolia*  
part II in end  
papers

In Sub-section Pardales the bulbs are surrounded by a loose coating of smooth lanceolate tunics with retrorse copper-coloured hairs and similar loose tunics, though glabrous, are found in several of the species growing in hot and arid regions. In *O. Sonderiana*, *O. petrea* and *O. senecta*, all small species, these masses of tunics may attain the size of a small hand-full and they require careful extraction. The undulation or crinkling of the outer tunics, especially in species with elongate bulbs such as *O. stenoptera*, *O. strigosa* and *O. comosa*, has yet to be explained. It seems to reach its climax in such species as *O. Massoniana* and *O. hirsuta*, in which the bulb structure is enclosed in a dense coating of interwoven linear crinkled brown tunics, not unlike the packing sometimes used for fancy chocolates, in the case of the latter species sometimes forming structures 15 cm. long. It is possible that the loose coatings referred to may, since they are usually found in the species growing in the drier regions, have the function of insulating the delicate bulb from the heat during the summer, for in such cases the bulb itself, when exposed, is soft and white and the nutritive scales have not the usual hardish adhering coat. In *O. Eckloniana* the hard outer tunics break away readily from the bulb.

The bulb tunics in *O. comosa* are conspicuously undulate and pilose with short setose or capitate hairs.

In § Cernuae (Costatae) and also in other species the outer tunics are vertically ridged and among these *O. copiosa*, *O. haedulipes*, *O.*

*tragopoda* and *O. deserticola* are peculiar for their pale ashy grey colour. In *O. obtusa*, *O. goniorrhiza* and *O. punctata* the outer coating is deeply and irregularly pitted and angled.

In many species the protective scales of the bulb are thin, papery and easily separable, but in some, e.g. *O. purpurea*, in which the bulbs have a hard outer coating, they are thick and fleshy in the young stage and exude a gummy secretion which binds them together almost inseparably as they shrink successively year by year. Especially in *O. porphyriosiphon*, *O. pulchella*, *O. foveolata*, *O. giftbergensis*, *O. luteola*, *O. ambigua*, *O. melanosticta* and *O. polyphylla*, var. *pubescens*, owing to this secretion, the outer coat becomes very hard, black and rough and the bulb is often of indeterminate shape, with particles of the surrounding soil or sand embedded in it. In *O. pulchella*, vars. *glauca* and *beneprotecta*, which often grow in narrow rock crevices, the bulb is sometimes moulded by the surrounding rock into a large shapeless gummy mass.

In three species, *O. Pocockiae*, *O. oreithala* and *O. lichenoides*, the outer tunics of the bulb project in four wide longitudinal wings, but I have not been able to observe the process of their formation. In *O. depressa* these wings are reduced to four mere ridges.

It will, I think, be evident from these notes that the bulb, its tunics and system of vegetative reproduction, in all the various types, offer a wide field for future study.

## (ii) THE RHIZOME.

The characters presented by the small scales and fibrous roots on the rhizome do not appear to be of practical taxonomic importance and they have in most cases been disregarded in the descriptions of the species. The average length, however, varies a great deal and, of course, gives a general indication of the depth of the bulb, but in several plants it does not by any means always ascend vertically and many bulbs can be lost by careless digging. The length of the rhizome which has been given in Pfeich-Oxal. in many of the descriptions of the species in which the bulb was unknown depends, of course, upon the point at which the collector broke it.\*

In a few species, e.g. *O. lasiorrhiza*, *O. truncatula*, *O. camelopardalis*, the rhizome is hairy, a good and distinctive taxonomic character.

\*Jacquin makes the following rather amusing remark: "If the plant is merely pulled out of the ground, the subterranean stem is often broken from the bulb and falsely resembles a branching root. As this frequently happens, it is clear why the root in dried specimens from the Cape was so incorrectly described by authors". (Jacq.-Ox., p. 3.)

## (iii) THE STEM.

The presence or absence of an exerted stem serves as a fairly reliable character in the determination of the species. A large number always produce a more or less erect stem, while in others it is never normally visible above ground, although under certain conditions, such as when the plant is struggling towards the light, a few of the acaulescent species may occasionally do so. Though there are some anomalous species such as *O. obtusa*, *O. levis* and *O. argillacea* which have both caulescent and acaulescent forms, this character has, as already stated, been used as one of the principal divisions in compiling the Analysis of the Species, but it must take a secondary place when considering the actual affinities.

The stem is usually greenish in colour, but in a few species, e.g. *O. gracilis*, *O. helicoides*, *O. Engleriana* and *O. duriuscula*, it is coated with a hard, smooth lightish brown cortex, an unmistakable character.

In a few species, e.g. *O. reclinata*, *O. gracilis*, *O. comosa*, *O. incarnata*, *O. Knuthiana* and in many forms of *O. hirta*, the stem is frequently branched, while in others it may produce a branch occasionally, probably through some retarding of the main growth. Branching specimens are sometimes found in herbaria which have obviously been grazed, e.g. the type specimens of *O. linoides*.

The stem foliage as apart from the leaves which form an apical tuft (described as "apically congested") varies considerably. In most species in the Sub-sections Sessilifoliae and Pardales they are fairly closely imbricate, while in Lineares and Glandulosae the stem usually only bears a few scales or abortive leaves. The line of distinction is not, however, always very definite.

In *O. tenuifolia* and *O. multicaulis* and some forms of *O. heterophylla* the stem leaves are pseudo-fascicled on very short abortive branchlets.

## (iv) THE PETIOLE.

The petiole, like the peduncle, has an articulation near the base, the short lower part being usually widened, flattened and somewhat scale-like, but there is no perceptible periodic movement at the articulation. In some species such as *O. cathara*, and particularly in §Foveolatae, this basal part has conspicuous stipule-like wings projecting above the articulation.

The upper internode is usually terete, but occasionally flattened\*

\*In some dried specimens the petioles may appear to have been flattened when they are not really so. In the key in Pfirch-Oxal. p. 340, spp. 680—683, which are distinguished under the heading "Petioli compressi", the petioles are not perceptibly flattened in the living plant or, indeed, in all dried specimens.

xx *laburnifolia*  
(See p. 140)

as in *O. compressa*, *O. palmifrons* and to a less degree in *O. stenoptera*, *O. zeekoevleyensis*, *O. Nortieri* and in *O. purpurea*, Forms E (ii) and (iii), x or, in the case of *O. fabaeifolia*, provided with foliaceous wings of varying width.

In the majority of the plants in Sub-sections Sessilifoliae<sup>the</sup> and Pardales, in all or at least the cauline leaves the upper internode is very short or entirely wanting, the leaflets being articulated to the squamiform base. In the § Crassulae the apex of the petiole is widened and swollen, particularly in the multifoliolate species and there is sometimes a distinct swelling at the base, just above the articulation.

In *O. ciliaris* the basal part sometimes bears indistinct reddish calli near the margins, but they are almost undetectable in dried specimens. (See note under *O. ciliaris*.)

#### (v) THE LEAFLETS.

The number and shape of the leaflets are naturally of great importance in the identification of the species and have been employed prominently in the Analysis, but these characters must be used with caution, particularly in the case of the heterophyllous species (See Part VI, Heterophylly) and it has been necessary to include a number of the variable plants, e.g. *O. Eckloniana* in more than one Group of this key. They are of considerably less value as sectional characters, thus, of the 5 species with unifoliolate leaves (Group 2), two only, *O. Drègei* and *O. simplex* are closely related, the remainder being each of widely divergent affinity.

The leaves of the great majority are 3-foliolate, but several of the multifoliolate species have 3-foliolate forms or varieties (See Part VI, Heterophylly). All the multifoliolate species have been brought together in Group 24 of the Analysis, but they are by no means of like affinity and in the classification of the species many of them fall into several different Sections and Sub-sections.

Generally speaking, the leaflets of the caulescent species are linear, oblong or narrow-cuneate, usually conduplicate and most often glabrous on the upper surface, while those of the acaulescent are generally much broader and flat. There are, however, many exceptions. A great variety of shapes occur and the accepted botanical terms are somewhat inadequate for describing them without a certain amount of qualifying detail. In the 3-foliolate species with the broader and non-conduplicate leaflets, usually the medial leaflet only is symmetrical, the two lateral being more or less gibbous on the lower outer margin. The great majority are incised or at least emarginate at the apex, leaflets with an acute tip being the exception.



Light sensitiveness, the drooping of the leaflets and folding along the medial nerve at night, is not common, but it occurs in *O. corniculata*, *O. latifolia*, *O. incarnata* and in several species in § Cernuae. In the great majority of those with broad leaflets there is not even conduplication, whereas the opposite is the case with the narrow-leaflet species, but the longitudinal folding, if affected by light at all, seems to be induced by full light rather than lack of it. The leaflets in such plants can hardly be considered light-sensitive, no movement taking place at night, but in some species individuals will be found in which, through growing more or less permanently in shade, the conduplicate leaflets at least tend to be more open. In Jacquin's figures of such plants, grown in Europe, the leaflets are usually flat and without the close folding which we observe in the wild plants.

Enlargement of the leaves after the flowering season has been noticed particularly in *O. tomentosa*, *O. Engleriana*, *O. Zeyheri*, *O. palmifrons*, *O. pes caprae*, *O. flava* (Form A) and *O. purpurea* (Form E (ii)) and the conduplication tends to disappear.

Undulation at the margins of the leaflets occurs in a few species, but this character alone is not as a rule of great specific or varietal value. The "crenulation" of the leaflets noticed by Sonder in *O. melanosticta* is purely an accident of drying and not a varietal character as he supposed.

I look upon the occasional glaucous colour of the leaves, which is so marked in *O. Sonderiana* when growing in northern Namaqualand, as epharmionic, for it has disappeared entirely and the leaves have assumed a natural green colour when bulbs have been transferred to Kirstenbosch for cultivation. This change in colour of the leaves is noticeable in many other South African genera when plants are moved from their natural habitat to less arid conditions.

The intralaminar secretionary structures which appear as pellucid streaks, occurring on the leaflets and also on the sepals in the Sub-section Pardaes and rather less obviously in *O. purpurea*, turn black in drying and constitute a character of great taxonomic importance.

Two or more calli, which are orange or reddish in the living state and similar to those on the sepals, are frequently found at the apex of the leaflet and less commonly in a row near the margin and these also turn black in drying. The calli are usually obvious and they provide fairly reliable, but not infallible, key characters in the Sub-section Lineares.

Purplish brown zonal markings sometimes occur, but are not constant, on the leaflets in *O. pes caprae* and in some forms of *O. adenodes* and variegation or brown-mottling is constant in *O. ambigua*, var. *fuscata*.

though rare in *O. purpurea* and *O. obtusa*. The markings usually disappear when the plants are dried.

(vi) THE PEDUNCLE.

The peduncle is articulated near the base in the same way as the petiole, but in this case the basal part is not so much widened and never winged. Its movements in the different stages of development, however, are not entirely uniform in all the species.

In the § Cernuae, in which the flowers are arranged in cymose umbels, the peduncle always retains its erect position, the pedicels alone deflexing, first in the bud and again while the fruit is ripening. They eventually resume a more or less erect position shortly before the seeds are ejected. The gradual transition from the § Cernuae to the unifloral § Oppositae has been referred to in Part IV, (ii) Arrangement of the Sections. In most of the species in the latter Section, in which the bracts are opposite, set at a second articulation rather above the middle of the peduncle, these deflexions only take place in the upper part, which appears to correspond with the pedicels in the § Cernuae. The species *O. strigosa* is, however, anomalous, for although the deflexion only takes place in the upper part of the peduncle, the bracts are alternate and there is no upper articulation.

There is, again, a transitional group of allied species in this Section (*O. zeekoevleyensis*, *O. ambigua*, *O. rhomboidea*, *O. crispula*, *O. luteola* and *O. adenodes*) in which a partial deflexion takes place at both the upper and lower articulation in such a way that the peduncle is arched over, usually bringing the ripening capsule below the leaves. The flower bud in *O. zeekoevleyensis* is cernuous, though the bracts are alternate, but in the remaining five species it is erect and the bracts opposite at an articulation.

In most of the remaining Sections, comprising the great majority of the species, in which the two bracts are alternate and there is no upper articulation, the deflexion takes place at the lower. In the case of the acaulescent plants the bending obviously cannot be so abrupt, but the ripening fruit is hidden below the leaves and generally pressed to the ground. In all cases the peduncle finally assumes an erect position, raising the capsule free from the leaves before the forcible expulsion of the seeds takes place. Thus, during the ripening, the capsule is upside down or nearly so, for there is no zig-zag bending as in *O. corniculata*, in which the pedicel is re-bent upwards immediately below the fruit; and the capsule, although it is lowered down and protected by the leaves while ripening, is always maintained in a more or less upright position.

The length of the peduncle, in comparison with that of the leaves, is normally fairly constant in each species, e.g. in *O. psilopoda*, *O. ioeides* and *O. Fergusoniae* it is always many times longer, while in such species as *O. rubro-punctata*, *O. palmifrons* and *O. grammopetala* it is rarely more than 1 mm. in length. Such species are, however, rather exceptional and, owing to epharmonic variation, it is not safe to use such a character for key distinction.

The pair of bracts vary in size, position and to a certain degree in shape and may rarely be reduced to one or be entirely wanting. They often bear calli, somewhat similar to those on the sepals, but usually proportionately longer. Their approximate position on the peduncle is given in the descriptions, but their exact size and shape are often omitted where this is considered unimportant.

Some care is required in distinguishing between the opposite and the alternate bracts, the latter being sometimes sub-opposite, but the upper articulation, in the case of the former, can usually be detected quite easily with a hand lens. The large bracts in § *Stictophyllae*, which are placed *below* the middle of the peduncle, are worthy of special notice.

#### (vii) THE SEPALs.

The sepals, in spite of their superficial similarity, are generally very constant in each species and provide characters of considerable taxonomic importance. Imbricate in the lower part, the two outer being a little broader than the three inner, they vary in the different species from ovate to linear, but they are most commonly more or less lanceolate or oblong-lanceolate in shape.

In the great majority of species they are uniform in length, their constant inequality in *O. inaequalis* being an exceptional specific character. The occasional elongation and spatulate shape of one or two of the sepals is apparently an abnormality (See Part IX, Teratology). Short, blunt, lateral spurs are found at the base of the outer sepals in *O. dilatata*, but although that species has been upheld on the evidence of this character, it is doubtful whether it is really separable from the group-species *O. depressa*.

Though in some species the sepals are entirely ecallose, in others they bear two or more orange or reddish apical calli which turn black in drying. In such plants as *O. multicaulis* and *O. Sonderiana* these calli are elongate, very conspicuous and extend roughly to the middle of the sepal, while in many species they are small and difficult to detect in dry specimens, and in a few they are sometimes present and sometimes absent.

In *O. callosa*, *O. Stokoei* and in the group-species *O. ciliaris* there is an indistinct reddish callose thickening along the margins of the sepals, but the narrow purple edges found in many of the species, do not appear to be of reliable systematic value.

The longitudinal streaks appearing on the sepals in certain species have already been referred to in Part XII, (v) Leaflets.

#### (viii) THE COROLLA.

The corolla varies a great deal in size and shape and almost every shade of colour occurs except blue. In *O. pusilla* it is sometimes no more than 6 mm. long, while in *O. purpurea* it may attain to 4.5 cm. The length given in the descriptions is that of the flattened petal as it appears in pressed specimens.

The size of the corolla often varies considerably in the same species and depends greatly on epharmonic conditions: the early flowers too are often smaller than the later. In specimens of *O. purpurea* (Form G, *O. breviscapa*), collected in northern Namaqualand, the average length of the corollas was only about 1 cm., but in cultivation they attained twice that size.

The shape given in many of the original descriptions is often quite inaccurate for it cannot, as a rule, be judged from dried specimens. Only four species (§ Campanulatae) have a corolla which can be described as campanulate. In many species the tube\* is roughly the same length as the laminae, but where there is a marked difference, it has been described as longer or shorter and its shape as widely or narrowly funnel-shaped, subcylindrical or cylindrical. The laminae nearly always curve out to the horizontal in the open flower and are even reflexed in such species as *O. reflexa*, *O. helicoides* and *O. hirta*, var. *polioeoides*. As the tube approaches the cylindrical, so the corolla becomes more hypercrateriform. A slightly inflated or very narrowly cyathiform tube is only found in the group-species *O. purpurea* and to a lesser extent in *O. inconspicua*.

The shape of the petals, when separated, is fairly constant in each species or variety. In the descriptions the term claw is used to signify a more or less abrupt narrowing of the lower part and is not applied to the small, free subdeltoid unguicula at the base. In convolution they

\*The word tube has been used somewhat loosely in the descriptions. Its upper limit is indefinite, but is taken as the point at which the laminae commence to spread abruptly and where, except in the concolorous yellow corollas, the colour change takes place. The point at which coherence of the petals ceases and the laminae become free may be of more importance than I originally suspected, but since it is practically impossible to detect it except in the living plant, it has been disregarded.



appear to follow no rule, right and left handed flowers sometimes occurring on the same plant.

The colour given for the corolla is that of the laminae of the petals, the colour of the tube mentioned separately. In the great majority of species the tube is yellow, in a few, particularly in § Cernuae, greenish and very rarely, as in *O. porphyriosiphon* and *O. polyphylla*, var. *concolor*, purple. The line of demarcation between the colours is fairly abrupt, but occasionally there is a conspicuous purplish or rarely white ring or "eye" in the throat. This is not, however, always a constant character. The extension of the yellow colour of the tube to half way up the laminae has only been observed in *O. Massoniana* and *O. ciliaris*, var. *Pageae*. A reddish purple or more rarely buff marginal stripe along the outer margin beneath the petal is a common character in the genus, but it is not always of reliable taxonomic value and certainly not an infallible key character.

The presence of hairs on the corolla, either simple or gland-tipped, constitutes a constant character, but the calli which occur in some species near the apex of the laminae, are not specifically reliable.

#### (ix) THE STAMENS.

In all South African *Oxalis* the stamens are more or less connate into a tube at the base and in spite of epharmonic variations in the size of the corolla, they are fairly constant in length in each species, variety or Form. In the measurements given, *the connate part is included* in the length.

In the majority of the species the stamens and styles stand more or less erect, although the short styles are bent outwards to present the stigmas outside the filaments. Here the anthers are usually oval. In the § Sagittatae, however, the arrangement of these organs is different. When released from the tube of the corolla, the two lower sets (whether stamens or styles) spread out widely and only the longest set stands erect. In the longi-stylar flowers and styles are erect and both sets of stamens spreading, while in the medio- and brevi-stylar flowers only the longer stamens stand erect. In this Section the anthers are sagittate in shape. (Fig. 3.)

The longest stamens and styles are sometimes exserted well outside the throat of the corolla, but are more often completely enclosed. Each species is constant in this respect.

In many of the species the inner or longer filaments bear tooth-like appendages near the base, while in others they are entirely absent. These teeth vary a great deal in size, even reaching 1 mm. in length

in *O. imbricata*, but they are sometimes reduced to mere gibbose swellings. They are very constant in each species and thus present a reliable taxonomic character, though unfortunately they are very difficult to detect in dried specimens. It has been suggested and it seems very probable that these teeth are the rudiments of a third whorl of stamens, such as occur in the genus *Hypseocharis* (Oxalidaceae), thus accounting for the absence of one of the alternating whorls in the *Oxalis* flower.

In the medio- and brevi-stylar forms of *O. monophylla*, *O. petraea* and *O. Sonderiana*, var. *alba* the apices of the longer filaments project in a small beak above the anthers and in the same forms of *O. stenoptera*, *O. inconspicua* and *O. zeekoevleyensis* they are recurved. Though they can only be observed on dissection of the flowers, these characters are of important taxonomic value.

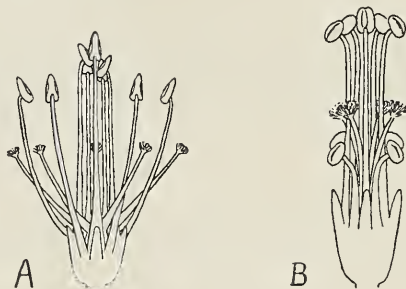


FIG. 3. A. Arrangement of styles and stamens in *O. Eckloniana*, § *Sagittatae*, when released from the corolla tube and B. *O. purpurea* L. (*O. variabilis*, Jacq.), enlarged. Note.—In the long-styled form of A the styles are erect and both sets of stamens are spreading.

The shorter filaments are nearly always glabrous or almost so. The nature of the hairs on the longer, in the great majority of cases glandular, has been recorded in the descriptions, but they are of minor taxonomic importance. Unfortunately I have not recorded the size of the anthers nor the colour of the pollen, though in a few cases where I have noticed that the pollen is white and not the usual yellow, the fact has been noted.

#### (x) THE OVARY AND CAPSULE.

The ovary is usually ovoid or ovoid-cylindrical in shape and from 1—1.5 mm. long. In the descriptions its shape and size are only given where somewhat exceptional. In the great majority of species it is glabrous on the lower half and pubescent on the upper or at least towards the

apex, occasionally with glandular hairs and but rarely entirely glabrous. In some species it bears a number of small calli on the upper part, usually either vermilion in colour or pellucid as in the Sub-section *Pardales*. These calli darken to black or brown in the dry state and constitute good specific characters.

The number of ovules in the ovary is by no means constant in a species and slight variations may be found in the five chambers of the same ovary. The species in which the seeds are exendospermous have from 1 to 5, rarely 6 ovules in each chamber, *O. fragilis*, with 8, being the one exception. In roughly two-thirds of those with endospermous seeds the chambers are more than 5-ovuled, those with exceptionally high numbers being *O. senecta* and *O. grammopetala* with about 24 and *O. convexula* with about 18, but the remainder, some 30 or more species, are few-ovuled. Beyond this general tendency, I am unable to correlate the number of ovules in any way with other characters by which the species have been grouped. Though in some cases they provide a clear distinction between certain species, it is evident that no general classification could be founded upon them.

The capsule is usually more or less globular or oval, but in several species in the Sections *Cernuae* and *Lineares* it elongates and is well exerted from the calyx. This elongation, curiously enough, does not appear to have any direct relationship to the number of ovules in the ovary and it sometimes takes place where the chambers contain only 3—5 ovules, whereas in the multi-ovulate species *O. senecta* and *O. grammopetala* there is no elongation. The character is certainly of taxonomic importance. (For notes on the seeds and their germination see Part XI).

#### (xi) THE STYLES.

There is a great deal of variation in the thickness of the styles and their diameter is by no means proportionate to the size of the corollas. Their length has not been given in the descriptions, but the stigmas in each of the three styler forms are approximately at the same height as the corresponding anthers. Though they are usually enclosed and hidden in the tube, in several species they are well exerted.

The long and medium styles are nearly always hairy, most commonly with short capitate hairs on the upper half and longer simple hairs on the lower, the two kinds of hairs frequently overlapping and being intermixed towards the middle. The shortest are usually glabrous, at least on the upper part. The descriptions of the hairs, therefore, apply only to the two longer forms. In a few species the upper hairs are pluricellular, a good specific character.

The curving and spreading of the styles in some species has been alluded to in Part XII (ix), The Stamens.

### (xii) THE HAIRS.

Three kinds of hairs occur commonly in the genus, (a) simple unicellular hairs, (b) glandular-capitate hairs and (c) longish uniseriately pluricellular, but not capitate hairs, the latter being referred to in the descriptions as pluricellular. The capitate hairs are in most cases short, but are frequently more than 1-celled.

The nature and position of the hairs are of some taxonomic importance and in the case of plants with pluricellular hairs, they seem to provide a very reliable character. A few gland-tipped hairs sometimes occur where the indument is normally simple and in some species the simple and glandular hairs are almost equally intermixed. In others the hairs are all simple or all glandular in different Forms. I have not relied on the presence of glandular hairs alone in separating species or varieties, e.g. the two colour variants of *O. Meisneri* each have a glandular and non-glandular Form.

In *O. pulchella* and *O. foveolata* the hairs are comparatively thick and hyaline, but such hairs are not common in the genus. The thick short hyaline ascending ciliate hairs found on the leaflets of *O. adenodes* Forms C and D, *O. Eckloniana*, var. *Sonderi*, Form B and in some specimens of *O. truncatula* require more investigation, for plants with and without them sometimes occur in the same colony.

Caducous ciliate hairs on the leaflets have only been observed in *O. nidulans*.

The term 'tomentose,' which has previously been applied to the leaflets in *O. tomentosa*, *O. foveolata* and *O. algoensis*, can hardly be justified.

## XIII. ON COLLECTING AND PRESERVATION OF OXALIS SPECIMENS.

New species of *Oxalis* cannot be satisfactorily described from dried specimens. The floral characters are highly important and descriptions of the corolla (shape of the tube and petals), androecium (teeth on the filaments) and details of the ovary can only really be ascertained from living flowers\* or flowers preserved in alcohol. When the corolla is once

\*I have worked principally from cultivated flowers, but the bulbs often do not become acclimatised or flower for several years and a few have never flowered at all.



crushed these details cannot be obtained by boiling or soaking out the flowers.

In all cases, however, it is desirable to procure presentable herbarium specimens with the corolla open and the petals unshrivelled. This cannot be done by collecting specimens into a general botanical press, even if the bulbs are stored separately, for, at the first change of drying papers the flowers will collapse, if not before. It is only possible to preserve the corolla in a natural-looking open state by using special appliances.

For collecting all but the larger species and indeed the flowers of even these, I have used a number of special pressing books measuring  $5\frac{1}{2} \times 8\frac{1}{2}$  inches, opening along the shorter side as in a sketch-book. Books opening along the longer side as in a novel are useless. (See Plate I (iii)). The covers are of fairly stout straw-board and hold 40—50 pages of ordinary porous botanical drying paper or blotting paper, held in at the hinge by an elastic band, not stitched. Between each page of the book is inserted a loose folded slip of semi-porous paper, unprinted newspaper\* will serve, but a slightly stouter paper is rather better.

The slips, when folded lengthways, should be rather smaller than the pages of the book, otherwise too much care is required in placing them. The upper cover of the book should be distinctly marked TOP to prevent opening it at the wrong end and the whole is secured with 5—6 stout rubber bands,  $\frac{1}{2}$ -inch wide, which should be slipped on to the wrist and so not be mislaid while using the book. Commence inserting the specimens from the bottom or end of the book and work upwards.

The open† corollas should be placed *face downwards* near the hinge or fold of the slip and kept under hand pressure with the upper flap of the slip while the leaves are suitably spread out (some reversed) and the upper flap brought down over them. Space does not permit of describing the exact method of handling the book, but once the knack of using them is acquired, specimens can be inserted at great speed. The main essentials for success are to work the book on a firm surface (the ground is always handy), always to keep hand pressure on the part of the book already filled and never to open that part of the book already filled, or the slips, until the corolla has 'set' and adhered to the lower flap. Some form of book-marker will be found useful, a twig or straw, but I have found the quickest method is to misplace the next vacant slip slightly so that it protrudes at the side of the pages. The slips can safely be transferred to a large drying press after 2 days and the books, if thoroughly dry, refilled with fresh slips.

\*I once refilled my books, in an emergency, with printed newspaper and found that the ink "came off" on the petals.

†A partially opened corolla can often be opened completely by blowing into it.

If the corolla is placed as directed it will not adhere to the upper flap. When dry, except in the case of a few very sticky species, the crisp corolla can be coaxed off the slip by bending the paper or with forceps, but it is advisable to poison the flower as soon as possible with a soft brush, while it is still adhering to the lower flap.

Spare flowers will always be found useful and in the case of species with very short peduncles or very succulent leaves the flowers, or some of them, should be taken off and dried separately, in order to keep them free from the leaves.

One large book of similar design will be found convenient for bigger species.

Bulbs *must be collected* for specimens. Unless minute, they should be detached and stored in paper bags, which must, of course, be numbered to correspond with the specimens.\* It is highly inadvisable, though tempting, to leave a fringe of bulbs hanging from the book. If they do not themselves fall off, the outer tunics certainly will.

If possible all three styler forms should be collected, but I admit that it is a trying task to find them when collecting largely. If, however, bulbs are collected for cultivation, it must be remembered that if only one styler form is represented, no seeds will ever be obtained.

Since the nature of the seed is an important factor in the classification of *Oxalis*, specimens with fruiting capsules, even if only semi-ripe, should be collected if possible.

By far the best instrument for ordinary bulb digging is a 'modified' military entrenching tool. The square blade should be cut down to an oval shape and the chisel end hammered and lengthened out to a sharp point.† Any blacksmith, given precise directions, can modify these tools if they can still be obtained. The ordinary spud or trowel is of no use in the hard stony soil in which many species of *Oxalis* grow. Since some of the bulbs lie at a great depth, if collecting from a car or lorry, a crowbar will be found invaluable.

In good *Oxalis* country, in a good season and on sunny days, *Oxalis* collecting is a whole-time job between about 10.30 a.m. and 4.30 p.m., when the flowers are open. The collector need have no compunction as regards the quantity of specimens collected. Where *Oxalis* do grow, they are generally so abundant that they cannot be exterminated.

A surprising number of species can be seen while driving along at a

\*It is absolutely essential to number the specimens and record their localities *at the time of collecting*, otherwise those botanical abominations, specimens of doubtful or wrong locality will be the certain result. In collecting from a car, along or near roads, temporary locality records can be made by speedometer readings, but a careful system must be evolved.

†See Frontispiece.



(i) Namaqualand in winter; the old road.

[Photo : Author.



(ii) *Oxalis disticha* Jacq., an aquatic species, growing in a clay pool near Pools siding, north of Piquetberg.



[Photos : S. Garside.

(iii) Working with one of the special collecting books described in Part XIII of the Introduction.





moderate speed in a car, for there are few other brightly coloured flowers open in mid-winter. A stop will often result in others, less conspicuous, being found in the vicinity and further experience soon begins to tell what is likely *Oxalis* ground. The collector must, however, be entirely his own master, stopping when and where he will and being content, if needs be, with a very short days run. A companion, unless as enthusiastic as himself, will be a handicap.

There is, of course, unlimited work to be done in connection with the co-called "known" species, but the future collector who is able to get off the beaten track in Namaqualand and probably Bushmanland, which is as yet untouched, will undoubtedly discover many new species and varieties. Above all I would recommend the somewhat inaccessible escarpment of the Bokkeveld and Kobe Mountains, with their outlying spurs Matsiekamma and Gift Berg in the Van Rhyn's Dorp Division and the immediate hinterland. This area has only been touched in two places, each of which yielded a surprising number of novelties.

*Oxalis* bulbs undoubtedly have the power of lying dormant in an unfavourable season. I have several times made long journeys with a view to further field observation of some local species or for more complete material, only to find that in the spot in which it had previously occurred in abundance, a year or so later there were not even leaves to be seen.

Finally it may be said that a break in the weather is a disaster.

#### XIV. ACKNOWLEDGEMENTS.

In addition to those to whom I have, in other parts of the Introduction, already recorded my thanks for the help they have afforded me, I must add the Directors of the Natural History Museum at Stockholm; the South African Museum, Cape Town; the National Herbarium, Pretoria and the Albany Museum, Grahamstown for the loan of their collections. I am much indebted too for assistance from the late Sir Arthur Hill, Director of Kew Gardens, the Keeper of Botany at the British Museum and particularly to Mr. A. W. Exell, at the latter institution, for help in the comparison of specimens.

I would like especially to thank Dr. L. Bolus, the Curator of the Bolus Herbarium, for her kindness in putting one of the principal bays in the Herbarium at my disposal for many years and also for her encouragement and help during the early stages of my work. Also to Mr. N. S. Pillans, whose guest I was on my first two trips to the Clanwilliam and Van Rhyn's Dorp districts, in the course of which I first became fascinated by the copious variety of the genus *Oxalis*. His

accommodation of my living plants in his garden I have referred to elsewhere and I must add to this his readiness and patience in discussing the endless difficulties which the genus presents.

I am indebted also to Dr. M. R. Levyns and Mr. S. Garside for technical advice in preparing several parts of the Introduction and to Professor R. S. Adamson for photographs and many useful suggestions. It would take too much space to thank individually all the collectors who have from time to time sent or brought me specimens and those companions who have assisted me in collecting. I am glad to have been able to commemorate the names of a few of them in the nomenclature of new species.

Finally I wish to record my gratitude to Professor R. H. Compton for allowing this work to appear as a Supplementary Volume to the Journal of South African Botany, for permission to reproduce the illustrations which have already appeared in that Journal, for assistance in proof-reading and for editing and seeing it through the press.

#### XV. CONCLUSION.

May I say, in conclusion, that I am well aware of the incompleteness of this work as a taxonomic revision. For various reasons I have been prevented from continuing the intensive collecting of the earlier years of my study of the genus and there are many field problems which I should like to have attempted to solve. I have already mentioned some of the practical difficulties involved in obtaining all the necessary data, but I believe a more complete knowledge of the bulb history and system of vegetative reproduction to be one of the most important objects for future investigation.

Although I am greatly indebted, first to Mr. N. S. Pillans, in whose garden I first attempted the cultivation of *Oxalis* in pots and later to Professor R. H. Compton and his staff at the National Botanic Gardens at Kirstenbosch for the facilities which he placed at my disposal for growing *Oxalis* both in the main gardens and also in the nursery, it has been a handicap having no garden of my own, where the plants could have been more constantly under observation. Nor is Kirstenbosch, with its heavy winter rainfall, at all suited to some of the species from drier regions.

The greatest difficulty has been to decide how to treat the complex groups which I have referred to as "group-species." The relegation of so many time-honoured species to synonymy will, I fear, arouse some sceptical doubt in herbaria where the range of specimens is small and all the intermediate forms cannot be seen. Without a knowledge of all

these forms, it is easy to point out the differences between a selection of plants in such a group and I would suggest to those who, in the future, contemplate splitting up the group-species, that they should work on an even larger scale than I have done and not form their opinions on the evidence of too few specimens.

Any study of so large and complicated a genus must necessarily be only one more step towards its better understanding and I have therefore placed on record, for the information of my successors, such further knowledge as I have been able to acquire. They will, no doubt, find many of my conclusions to be questionable, but I shall, I hope, have suggested some new lines for further investigation. I have endeavoured to give, for the first time, as far as possible an account of the South African *Oxalis* as they really are and not as they, or parts of them, appear when pressed and affixed to herbarium sheets. I realise that the foundations of the systematic botany of this country had to be laid almost entirely on the scrutiny of herbarium specimens, but field study of many of our genera at once shows up the grave shortcomings of this unsatisfactory method of work.

**OXALIS.** L. Gen. Ed. I (1737) 134.

Flowers regular. Sepals 5, imbricate. Petals 5, hypogynous, cohering towards the base; aestivation convolute. Stamens 10, all antheriferous, connate at the base or more rarely free, 2-seriate, the outer (shorter) opposite the petals, the inner (longer) opposite the sepals\* (obdiplostemonous), the latter often gibbose or with distinct teeth near the base. Anthers dorsifixed, introrse in the bud, with extrorse longitudinal dehiscence by slits. Ovary superior of 5 carpels, 5-lobed, 5-locular, syncarpous, terminating in 5 free styles: stigmas terminal, 2-fid, penicillate or laciniate. Ovules many in 2 rows, few or one in each loculus on axile marginal placentae, anatropous, with micropyle facing upwards and outwards. Capsule dehiscing loculicidally, the septa formed by the coherent portions of adjacent carpel valves adhering to the axis. Seeds 1—many in each loculus, with inner layers of testa either indurated, or thin, delicate and membranous, enclosing an embryo embedded in fleshy endosperm or an embryo only without endosperm; outer layers of testa becoming fleshy, ultimately everting explosively and ejecting the contents.

Acaulescent or caulescent annual or perennial herbs, often bulbous, rarely undershrubs. Leaves radical or cauline, alternate, without stipules, digitately 3—many-foliate or pinnately 3-foliate, more rarely 2- or 1-foliate or phyllodineous. Peduncles radical or axillary on the stem, 1-flowered or with several-flowered cymose umbels. Bracts small, numerous or 2, more rarely 1 or 0. Flowers monomorphic, dimorphic or trimorphic, rarely also cleistogamous. *The generic definition has been amplified to include the species with exendospermous seeds.*

With the exception of the annual *O. corniculata* L., a cosmopolitan weed with monomorphic flowers, all the South African species are perennials with bulbs, frequently with contractile roots and with a distinct, often very long rhizome or underground stem. The great majority have been observed to have trimorphic flowers and it is probable that they all have. In *O. latifolia* H. B. K., introduced from Mexico, the underground stem is reduced to a disc, the leaves and peduncles having bases modified to form nutritive bulb scales. No species with pinnate leaves or bifid stigmas occur and none with entirely free petals.

No cleistogamous flowers have been observed either in wild plants or in cultivation and they probably do not occur.

\*I cannot agree with the statement in Pflrch-Ox., p. 43, that the outer (*minora*) stamens are opposite the sepals and the inner (*majora*) opposite the petals.



## FIRST PUBLICATION OF NEW SPECIES.

The following new species are published for the first time in this volume.

- (24) *O. tragopoda* Salter.                      (131) *O. pseudo-hirta* Salter.  
 (49) *O. extensa* Salter.                        (178) *O. oreophila* Salter.  
 (69) *O. oreithala* Salter.

## EXPLANATORY KEY TO THE ARRANGEMENT OF THE SPECIES IN SECTIONS AND SUB-SECTIONS.

(A separate general analysis of the species will be found on pages 55—72.)

- |  |   |
|--|---|
| Plant without a bulb : peduncle more than 1-flowered ..  | SECTION or sub-section.<br>A. CORNICULATAE<br>(Sp. 1) |
| Plants with bulbs  |   |
| Underground stem reduced to a disc, the leaves and peduncles having bases modified to form nutritive bulb scales : corolla rosy-mauve.. .. .   | B. IONOXALIS<br>(Sp. 2)                               |
| Underground stem or rhizome present, the petioles and peduncles arising at its apex or from an exerted stem.   | C. CERNUAE  |
| Peduncles more than 1-flowered : seeds endospermous..  | (i) Eu-cernuae  |
| Flowers yellow .. .. .   | (Sp. 3—9)   |
| Flowers reddish, rose, pale violaceous or white.   |   |
| Leaflets more or less bilobed.   |   |
| Bulb without an apical beak.   |   |
| Caulescent : bulb tunics longitudinally ridged, pilose at the apex : peduncles, or at least one cauline : pedicels and sepals glandular-pilose .. .. .                                     | (ii) Lividae<br>(Sp. 10—12)                           |
| Stem not exerted : bulb tunics smooth, entirely glabrous : peduncles basal.. .. .  | (iii) Purpuratae<br>(Sp. 13—15)                       |
| Bulb with an apical beak.  |   |
| Outer bulb tunics conspicuously longitudinally ridged .. .. .  | (iv) Costatae<br>(Sp. 16—17)                          |
| Outer bulb tunics smooth .. .. .   | (vi) Stellatae<br>(Sp. 19—25)                         |
| Leaflets entire .. .. .  | (v) Goetzea<br>(Sp. 18)                               |
| Peduncles 1-flowered.  |   |
| Styles and stamens the longest erect, the short and medial spreading on release from the corolla tube : anthers sagittate : leaflets 3, variously shaped : seeds without endosperm .. .. . | G. SAGITTATAE<br>(Sp. 84—88)                          |
| Styles and stamens not spreading : anthers oval or oblong.   |   |
| Plants somewhat succulent for the genus : scales enclosing the bases of the petioles large, ovate : petioles conspicuously articulated to the much   |   |

widened or winged base, usually pulvinate at the apex: plant readily falling apart at the articulations in the dried state: stem never exerted: leaflets 1—many: seeds without endosperm . . . . .

J. CRASSULAE  
(Sp. 111—118)

Plant not having all the above characters.

Bracts 2, usually opposite, arising from an upper articulation on the peduncle: seeds endospermous. (Exceptions, *O. strigosa* and *O. zee-koevleyensis* have alternate bracts) . . . .

D. OPPOSITAE  
(ii) Bifurcatae  
(Sp. 48—55)

Leaflets bifurcate to the middle or below . . . .

(i) Subintegrae  
(Sp. 26—47)

Leaflets not bifurcate . . . . .

Bracts 0, 1 or 2 alternate, or if subopposite, not at an articulation.

Leaflets *normally* not twice as long as broad, or if oblong, never conduplicate.

Corolla widely campanulate: seeds without endosperm . . . . .

H. CAMPANULATAE  
(Sp. 89—93)

Corolla tube more or less funnel-shaped.

Leaflets rather fleshy, often small, the epidermal cells comparatively large, the surfaces conspicuously impresso-punctate or honeycombed when dry: leaflets 3, broad, never oblong except in *O. pulchella*, var. *leucotricha*: seeds endospermous. . . . .

F. FOVEOLATAE  
(Sp. 59—83)

Leaflets not as above.

Bracts below the middle of the peduncle, distinctly callose: leaflets striolate or black dotted when dry: seeds endospermous . . . . .

E. STICTOPHYLLAE  
(Sp. 56—58)

Bracts above the middle of the peduncle: seeds without endosperm (*A miscellaneous Section*) . . . . .

I. LATIFOLIOLATAE  
(Sp. 94—110)

Leaflets normally linear or oblong, at least twice as long as broad, usually much more, often emarginate, but never bifurcate: seeds without endosperm . . . . .

K. ANGUSTATAE

Leaves and sepals striate with pellucid lines which turn black in drying: bulb tunics clothed with retrorse hairs . . . . .

(i) Pardales  
(Sp. 119—129)

Leaves, sepals and bulb tunics not as above. Stem leafy: leaves, at least the lower, sessile, subsessile or very shortly petiolate: peduncles often cauline: leaflets always 3 . . . . .

(ii) Sessilifoliae  
(Sp. 130—144)

Stem not leafy or rarely with a few leaves: leaves apically congested, distinctly petiolate: peduncles nearly always apical, except in *O. Henrici*.

in

Hairs all pluricellular, not capitate, without simple hairs admixed . . . .

(iii) Xanthotriche  
(Sp. 145—147)

\*I<sub>cb</sub>  
stamens a

Hairs capitate (sometimes pluricellular)

- or simple, or plant entirely glabrous.  
 Leaflets normally 3, but sometimes in  
 varieties 5—7: in *O. Burtoniae*  
 usually 7.
- Plants with simple hairs (sometimes  
 with a few inconspicuous capi-  
 tate hairs on the peduncle .. (iv) Lineares  
 (Sp. 148—186)
- Plants clothed with capitate (some-  
 times short pluricellular) hairs.. (v) Glandulosae  
 (Sp. 187—193)
- Leaflets normally more than 3 (except  
 in *O. variifolia*, var. *ternata*) .. (vi) Multifoliolatae  
 (Sp. 194—200)
- Species not attributed to any of the above  
 Sections .. .. . (201) *monophylla*  
 (202) *ligulata* = *obtusata* form B  
 (p. 107)

## ANALYSIS OF THE SPECIES.

- Peduncle more than 1-flowered.  
 Plant without a bulb, branching, more or less prostrate :  
 corolla very small, yellow. (CORNICULATAE) .. (1) *corniculata*
- Plants with bulbs.  
 Underground stem or rhizome well developed, the  
 petioles and peduncles arising from its apex or from  
 an exserted stem (CERNUAE) .. .. . Group 1
- Underground stem reduced to a disc, the leaves and  
 peduncles having bases modified to form nutritive  
 bulb-scales : corolla rosy-mauve. (IONOXALIS) .. (2) *latifolia*
- Peduncle 1-flowered.  
 Leaves simple .. .. . Group 2
- Leaves compound.  
 Inner petioles leafless, lanceolate-ligulate : outer leaves  
 trifoliate .. .. . (202) *ligulata*
- All the leaves bearing leaflets.  
 Petiole winged : number of leaflets variable .. .. . (101) *fabaeifolia*
- Petiole not winged.  
 Leaflets 4 or more .. .. . Group 24.
- Leaflets 3.  
 Leaflets bifurcate to the middle or below .. .. . Group 3
- Leaflets not bifurcate, at the most obcordately  
 incised.  
 ‡Stem not or rarely developed above ground,  
 or if exserted then fleshy and entirely  
 leafless and usually only developed under  
 exceptional conditions. (*Stemless*.)
- Styles and stamens, the longest erect, the  
 short and medium spreading on release  
 from the corolla tube : anthers sagittate.  
 (SAGITTATAE) .. .. . Group 4
- Styles and stamens not spreading as above,  
 anthers oval or oblong.
- Bracts 2, opposite, arising from an upper  
 articulation on the peduncle .. .. . Group 5
- Bracts 0, 1 or 2, alternate, or if subopposite  
 not at an articulation.

- Leaflets rather fleshy, often small, the epidermal cells comparatively large, the surfaces conspicuously impressopunctate or honeycombed when dry  
Group 6
- Leaflets not as above, more or less smooth when dry.
- Hairs on petioles and peduncles uniseriately pluricellular . . . .  
Group 7
- Hairs not pluricellular.
- Leaflets linear-oblong or cuneate-oblong . . . .  
Group 8
- Leaflets more or less rotund, oval, ovate or obovate.
- Peduncles and petioles with conspicuous glandular-capitate hairs: leaflets (except in *O. petraea*) obovate, not broader than long . . . .  
Group 9
- Peduncles and petioles not glandular.
- Leaflets obovate, rotund or cuneate-rhomboid, widest above the middle . . . .  
Group 10
- Leaflets oval, ovate or elliptical  
Group 11
- ††Stem well developed above ground. (*Cauliscent*.)
- Water plants: base of the petiole winged: corolla widely campanulate . . . .  
Group 12
- Land plants: base of the petiole not winged (except in *O. convexula*): corolla tube funnel-shaped or cylindrical.
- Leaves and sepals striate with pellucid lines which turn dark in drying: bulb tunics clothed with retrorse hairs. (PAR-DALES) . . . .  
Group 13
- Leaves, sepals and bulb tunics not as above.
- Stem leafy: leaves, at least the lower, sessile, subsessile or very shortly petiolate: peduncles often cauline  
Group 14
- Stem not leafy or rarely with a few leaves: leaves apically congested, distinctly petiolate: peduncles nearly always apical.
- Bracts 2, opposite, arising from an upper articulation on the peduncle  
Group 15
- Bracts 0, 1 or 2 alternate, or if subopposite not at an articulation.
- Hairs all pluricellular, not capitate, without simple hairs admixed . .  
Group 16
- Hairs capitate (sometimes pluricellular) or simple or plant entirely glabrous.
- Leaflets obovate, cuneate obovate or elliptical, not twice as long as broad . . . .  
Group 17
- Leaflets oblong, linear or linear-cuneate, at least twice as long as broad, usually much more.
- Bulb acutely angled and pitted  
Group 18
- Bulb more or less smooth.
- Bulb small, not more than 1 cm. long . . . .  
Group 19
- Bulb more than 1 cm. long.
- Corolla hypercrateriform



- with a sub-cylindrical or  
very narrowly funnel-  
shaped densely pubes-  
cent tube rather longer  
than the laminae of  
the petals . . . . . Group 20
- Corolla tube more or less  
funnel-shaped.  
Stem corticate, polished,  
brown (longer fila-  
ments edentate) . . . . . Group 21
- Stem green, not corticate  
or polished.  
Fruiting capsule elon-  
gating well beyond  
the calyx . . . . . Group 22
- Fruiting capsule globu-  
lar or elliptical, not  
or scarcely exceed-  
ing the calyx . . . . . Group 23

## GROUP 1. Section CERNUAE.

## Key to the sub-sections.

- Flowers yellow . . . . . (i) EU-CERNUAE
- Flowers reddish, rose, pale violaceous or white.  
Leaflets more or less bilobed.  
Bulb without an apical beak.  
Caulесcent: bulb tunics longitudinally ridged, pilose  
at the apex: peduncles, or at least one, cauline:  
pedicels and sepals glandular-pilose . . . . . (ii) LIVIDAE
- Stemless: bulb tunics smooth, entirely glabrous:  
peduncles basal . . . . . (iii) PURPURATAE
- Bulb with an apical beak.  
Outer bulb tunics conspicuously longitudinally ridged . . . . . (iv) COSTATAE
- Outer bulb tunics smooth . . . . . (vi) STELLATAE
- Leaflets entire . . . . . (v) GOETZEA (18) *Davyana*

## Sub-section (i) EU-CERNUAE.

- Stem unbranched or plant stemless.  
Petioles conspicuously flattened: bulb tunics soft, brown . . . . . (3) *compressa*
- Petioles terete.  
Leaflets widely cuneate-obcordate, or bilobed to near  
the middle.  
Bulb tunics soft, brown . . . . . (4) *pes caprae*
- Bulb tunics hard, with conspicuous longitudinal ribs,  
pale ashy grey.  
Stem exserted: peduncles 2—4-flowered: stamens  
not exserted . . . . . (5) *haedulipes*
- Stemless: peduncles 1—2-flowered: stamens ex-  
serted from the corolla tube . . . . . (6) *copiosa*
- Leaflets reniform, widely incised at the apex . . . . . (7) *Luederitzii*
- Stem branching.  
Robust plant up to 70 cm. high: leaves opening after  
flowering . . . . . (8) *Knuthiana*
- Lax plant up to 16 cm. high: leaves opening with the  
flowers . . . . . (9) *Schaeferi*

## Sub-section (ii) LIVIDAE.

- Leaflets not divided below the middle: contractile root  
acting horizontally . . . . . (10) *dentata*



- Hairs simple: flowers scarcely exceeding the leaves: leaflets pilose above: longer filaments edentate .. (82) *densa*
- Hairs pluricellular, hyaline: flowers far exceeding the leaves: leaflets glabrous above: longer filaments dentate .. (83) *furcillata*
- Plants green, not as above.
- Bulb acutely angled and pitted .. (33) *obtusa*
- Bulb not as above.
- Stemless: leaves basal or closely imbricate on a short stem.
- Fruiting capsule elongating, well exerted: bulb tunics glabrous .. (55) *Smithiana*
- Fruiting capsule scarcely exerted.
- Outer bulb tunics lanate: plant more or less silky-villose .. (48) *heterophylla*, Form B.
- Outer bulb tunics glabrous, undulate: plant thinly villous or almost glabrous .. (49) *extensa*
- Stem well developed, sometimes branched, often with many cauline leaves.
- Lobes of leaflets narrowing conspicuously towards their base .. (51) *Tysoni*
- Lobes of leaflets not or scarcely narrowing towards their base.
- Peduncles all cauline, at least 6 times longer than the leaves .. (52) *orthopoda*
- Peduncles apical on the stem or branches.
- Leaflets longer than broad, narrow-cuneate at the base, with lobes more than 3 times as long as broad: calli on leaflets elongate, rather indistinct, distributed over the whole surface: bulb glabrous .. (50) *bifurca*
- Leaflets obdeltoid in outline, or broader than long, with widely spreading lobes, the lobes less than 3 times as long as broad: calli on leaflets none, or confined to the lobes only.
- Bulb oblong or lanceolate in outline, produced upwards into a long beak: tunics thickly pilose with setose and capitate hairs, undulate towards the base: sepals ecallose .. (53) *comosa*
- Bulb ovoid or ovoid-conical: tunics glabrous or lanate.
- Calli on lobes of leaflets conspicuous, black when dry, confined to the margins and apices of the lobes: corolla pale violet-mauve .. (54) *bifida*
- Calli on lobes of leaflets none or inconspicuous, crowded near the apex or spread over the lobe: corolla reddish purple .. (48) *heterophylla*

## GROUP 4. Section SAGITTATAE.

- Hairs viscous, pluricellular: corolla violaceous .. (84) *fibrosa*
- Hairs not viscous, simple or none.
- Rhizome enclosed within a tuniceous sheath: bulb narrow-oval, tunics dark brown: leaflets oblong, distantly denticulate-ciliate .. (85) *microdonta*
- Rhizome not as above: bulb more or less ovoid, tunics light brown.
- Bulbils produced on lateral underground stolons.
- Sepals glabrous or with a minute tuft of hairs at the apex: bulb small: corolla white: leaflets rotund or subobcordate, with deciduous denticulate ciliation .. (86) *nidulans*

- Sepals more or less hirsute: bulb medium-sized: leaflets rotund.  
 Leaflets denticulate, distantly ciliate: corolla rosy-purple or violaceous . . . . . (86) *nidulans*, var. *denticulata*
- Leaflets evenly and closely ciliate: corolla rosy-purple or orange . . . . . (88) *Eckloniana*, var. *hopefeltiana*
- Bulbils (if produced) nearly sessile on the rhizome: ciliation of the leaflets variable or none.
- Sepals more or less hirsute: bulb usually more than 1 cm. long: leaflets variously shaped, rarely glabrous: corolla variously coloured . . . . . (88) *Eckloniana*
- Sepals glabrous or with a small tuft of hairs at the apex: bulb less than 1 cm. long: leaflets oval, oblong or cuneate-obovate, glabrous: corolla white . . . . . (87) *minuta*

## GROUP 5. Bracts opposite.

- Bulb sharply angled and pitted: hairs on peduncles and petioles usually reversed . . . . . (33) *obtusa*
- Bulb not angled and pitted: hairs not as above.
- \*Leaflets more or less rotund, cuneate-rotund or oblong, often emarginate, but not deeply incised at the apex.
- Leaflets nigro-punctate.
- Leaflets glaucous above, always rotund: corolla yellow . . . . . (43) *luteola*
- Leaflets not glaucous above, but sometimes purple mottled, rotund, cuneate-oblong or oblong: corolla yellow or white . . . . . (40) *ambigua*
- Leaflets not nigro-punctate.
- Corolla yellow . . . . . (43) *luteola*
- Corolla rose, violaceous or white.
- Leaflets almost orbicular, bordered with a line of black calli: longer filaments edentate: corolla pale violaceous . . . . . (31) *orbicularis*
- Leaflets not as above.
- Longer filaments edentate: corolla rose, about 1-6 cm. long or less: bulb tunics brown, papery . . . . . (28) *ioeides*
- Longer filaments toothed: corolla white, 2 cm. long or more: bulb tunics dark brown, hard . . . . . (44) *adenodes*
- \*\*Leaflets obovate, obreniform or sub-bilobed.
- Corolla yellow.
- Leaflets sub-bilobed, glabrous above: rhizome glabrous: longer filaments edentate: *peduncle sometimes 2-flowered* . . . . . (6) *copiosa*
- Leaflets broadly obovate, silky-haired above: rhizome hirsute: longer filaments toothed . . . . . (36) *lasiorrhiza*
- Corolla not yellow.
- Leaflets more or less obreniform.
- Peduncle glandular-pilose . . . . . (29) *calvinensis*
- Peduncle pubescent . . . . . (30) *incerta*
- Leaflets obovate or sub-bilobed.
- Sepals with several linear calli reaching to the middle or below (more clearly seen on the inner side): leaflets often truncate, very densely silky with white or rusty hairs below . . . . . (35) *truncatula*
- Sepals with two small apical calli, or ecallose: leaflets not as above.
- Bulb tunics lanate: leaflets very broadly obovate.



- Leaflets adpressed-silky on both sides: hairs on peduncles subpatent . . . . . (34) *lanata*
- Leaflets glabrous above: peduncles adpressed pubescent with minute hairs on upper part of the peduncle only . . . . . (32) *Marlothii*
- Bulb tunics glabrous.
- Bulbs rostrate at the apex, not clustered: plants never glandular-pilose.
- Petals oblanceolate: leaflets sub-bilobed, sparsely pilose below: peduncles sometimes 2-flowered . . . . . (25) *anomala*
- Petals with a distinct claw: leaflets broadly obcordate, softly silky with long hairs below . . . . . (26) *psilopoda*
- Bulbs not rostrate at the apex: plant sometimes glandular-pilose.
- Leaflets more or less rotundate and not deeply incised: bulbs ovoid, not clustered: ovary glandular on the upper half. A small slender plant . . . . . (28) *ioeides*
- Leaflets obcordate or cuneate-obcordate, conspicuously incised: bulbs elongate, clustered: ovary pubescent on the upper half. A more robust plant . . . . . (27) *imbricata*
- GROUP 6. Leaflets impresso-punctate when dried owing to the collapsing of the comparatively large epidermal cells.
- Hairs thick, shining and translucent: hollow-dotting of the leaflets very conspicuous: bulb elongate, gummy.
- Longest styles or stamens 1.4 cm. long: tube of the corolla almost cylindrical: corolla yellow . . . . . (61) *foveolata*
- Longest styles or stamens less than 1 cm. long: tube of the corolla funnel-shaped, wider than the above . . . . . (62) *pulchella*
- Hairs not as above.
- Leaflets longer than broad.
- Hairs white, dense, giving the plant a pale greyish appearance: bulb tunics very numerous in a loose mass, the majority not adhering to the bulb: corolla white, pilose . . . . . (81) *senecta*
- Hairs and bulb tunics not as above.
- Bulb elongate or lanceolate in outline: medial leaflet cuneate, incised . . . . . (80) *Annae*
- Bulb more or less ovoid: medial leaflet not cuneate.
- Medial leaflet oblanceolate, subrhomboid or broadly rotund, with a smooth cartilaginous margin: longer filaments toothed. . . . . (76) *algoensis*
- Medial leaflet ovate-orbicular, conduplicate with a subfalcate medial nerve and without a cartilaginous margin: longer filaments edentate. . . . . (78) *Lawsonii*
- Leaflets as broad or broader than long.
- \*Bulb either angled and pitted, or broadly winged.
- Plant glandular: bulb sharply angled and pitted . . . . . (70) *punctata*
- Plant not glandular: bulb widely winged.
- Plant glaucous: longest styles and stamens exerted from the corolla tube: sepals ecallose: wings of the bulb undulate . . . . . (71) *lichenoides*
- Plant not glaucous: styles and stamens not exerted: bulb with 4 flat wings.
- Sepals bicallose at the apex: petioles with stipule-like wings at the base . . . . . (68) *Pocockiae*
- Sepals ecallose: petioles not as above . . . . . (69) *oreithala*

- \*\*Bulb not angled or winged, sometimes with rather prominent nerves.
- Corolla yellow, or sometimes in *O. inaequalis* and *O. Annae* copper-pink.
- Corolla pale yellow, petals violet-veined beneath : bulb ovate, with pinnate-nerved tunics : peduncle much shorter than the leaves . . . . . (75) *grammopetala*
- Corolla full yellow or copper-pink : peduncles equalling or longer than the leaves.
- Plant glandular, especially on petioles and peduncles : longest styles and stamens exserted from the corolla tube.
- Bulb more or less smooth : corolla yellow or copper-pink : sepals unequal . . . . . (72) *inaequalis*
- Bulb bullulate : corolla yellow : sepals equal . . . . . (73) *bullulata*
- Plant not glandular.
- Sepals spurred at the base : longest styles and stamens not exserted from the corolla tube : corolla glabrous : bulb more, or less, ovoid . . . . . (67) *dilatata*
- Sepals flat : longest styles and stamens exserted from the corolla tube : corolla pilose : bulb elongate, lanceolate in outline . . . . . (80) *Annae*
- Corolla rose-purple, rose, violaceous or white.
- Hairs on petioles and peduncles pluricellular or gland-tipped.
- Calli on sepals conspicuous and converging : bulb elongate : plant producing aerial bulbils in the leaf axils . . . . . (74) *Fergusoniae*
- Sepals ecallose : bulb more or less oval or ovate : plant without aerial bulbils.
- Hairs gland-tipped : bulb usually angled and pitted . . . . . (70) *punctata*
- Hairs pluricellular, not gland-tipped : bulb prominently netted-veined . . . . . (65) *setosa*
- Hairs on petioles and peduncles simple or none.
- Bulb lanceolate in outline : leaves rather soft in texture, often clothed with weak white hairs : longest styles and stamens exserted from the corolla tube . . . . . (80) *Annae*
- Bulb more or less ovoid : leaves thicker and more robust : longest styles and stamens (except in *O. convexula*) not exserted.
- Sepals acute, pilose.
- Petioles and peduncles densely hirsute : longer filaments toothed, ovary callose : leaflets with a smooth cartilaginous margin . . . . . (76) *algoensis*
- Petioles and peduncles sparsely pilose : longer filaments edentate : ovary ecallose : leaflets without a cartilaginous margin . . . . . (64) *obliquifolia*
- Sepals obtuse, glabrous or ciliate towards the apex : longer filaments edentate.
- Tube  $\frac{1}{3}$  the length of the corolla : petals  $\frac{2}{3}$  as wide as long, rose coloured : stem usually exserted and fleshy : longest styles and stamens exserted from the corolla tube . . . . . (59) *convexula*
- Tube  $\frac{1}{2}$  the length of the corolla : petals barely half as wide as long or oblanceolate, rosy-violaceous or white : longest styles and stamens not exserted.
- Corolla less than 1.4 cm. long : petals reflexed, narrow-cuneate . . . . . (66) *reflexa*
- Corolla more than 1.6 cm. long : petals with a distinct claw . . . . . (63) *depressa*

GROUP 7. Hairs on petioles and peduncles uniseriately pluricellular.

- Leaflets subtriangular in outline, straight-sided, obcordately incised at the apex: corolla yellow or white .. (96) *suavis*  
 Leaflets not as above.  
 Corolla yellow.  
 Leaflets conduplicate, cuneate or linear, emarginate .. (146) *argillacea*  
 Leaflets flat or undulate at the margin (never conduplicate).  
 Ovary callose: longest filaments not recurved at the apex .. (95) *aurea*  
 Ovary ecallose: longest filaments recurved at the apex.  
 Medial leaflet rotund, broadly cuneate at the base, flat .. (94) *stenoptera*  
 Medial leaflet oblong, undulate at the margin .. (94) *stenoptera*, var. *undulata*  
 Corolla not yellow.  
 Petiole with stipule-like wings at the base.. .. (65) *setosa*  
 Petiole not as above.  
 Medial leaflet broadly obcordate.. .. (97) *viscidula*  
 Medial leaflet variously shaped, but never obcordately incised at the apex.  
 Longest filaments recurved at the apex: ovary ecallose .. (94) *stenoptera*, var. *alba*  
 Longest filaments not recurved at the apex: ovary callose: leaflets sometimes linear or oblong .. (147) *adspersa*

GROUP 8. Leaflets linear, oblong or cuneate-oblong.

- Leaflets with a cartilaginous margin: petioles pulvinate at the apex .. (114) *flava*  
 Leaflets and petioles not as above.  
 Plant entirely glabrous: sepals ecallose: longer filaments toothed.  
 Sepals minutely penicillate, with inconspicuous calli: leaves 1—3, leaflets linear .. (186) *oligophylla*  
 Sepals not penicillate, ecallose: leaves numerous.  
 Petiole terete: leaflets linear or oblong, emarginate, at least 4 times as long as broad: corolla bright yellow .. (116) *namaquana*  
 Petiole flattened: leaflets cuneate, obcordately incised, about twice as long as broad: corolla pale cream-coloured .. (117) *Louisae*  
 Plant more or less pubescent or hirsute.  
 Hairs on peduncle gland-tipped .. (105) *tenella*  
 Hairs on peduncle simple or none.  
 Bulb tunics hard.  
 Plant rather densely hirsute: longer filaments toothed: leaflets 2—4 mm. broad .. (77) *Fourcadei*  
 Plant very sparsely pubescent, almost glabrous: longer filaments edentate: leaflets scarcely 1 mm. broad .. (174) *levis*  
 Bulb tunics soft: plant more or less pubescent: longest filaments edentate.  
 Leaflets acute, mucronulate: corolla white.. .. (184) *albiuscula*  
 Leaflets obtuse or emarginate.  
 Leaves 2—5: petioles dark brown: peduncles 1—2: corolla red .. (107) *Stokoei*, var. *longifolia*  
 Leaves 10—30: petioles pale: peduncles very numerous: corolla pale rose, with a white throat .. (185) *kamiesbergensis*

GROUP 9. Petioles and peduncles with conspicuous glandular-capitate hairs. Leaflets (except in *O. petraea*) obcordate, not broader than long.

- Leaflets entirely glabrous: sepals obtuse with vertical rows of light reddish-brown callose dots and lines about the apex and margin: ovary callose . . . . . (93) *uliginosa*
- Leaflets ciliate with glandular-capitate hairs: sepals with capitate hairs: ovary ecallose.
- Sepals callose at the apex, obtuse: medial leaflet broader than long . . . . . (103) *petraea*
- Sepals ecallose.
- Sepals obtuse: leaflets nearly twice as long as broad . . (99) *amblyosepala*
- Sepals acute: leaflets exactly obcordate, or somewhat cuneate at the base, nearly as broad as long . . . . (98) *campylorrhiza*

GROUP 10. Petioles and peduncles not glandular. Leaflets obcordate, rotund or cuneate-rhomboid, widest above the middle.

- Bracts below the middle of the peduncle, distinctly callose.
- Leaflets striolate with short faintly pellucid lines which turn black in drying: sepals striate . . . . . (56) *purpurea*
- Leaflets black dotted: sepals not striate.
- Bulb tunics pilose with brown hairs at the apex: leaflets very dark green above: corolla white . . . . . (58) *rubro-punctata*
- Bulb tunics glabrous: leaflets not dark green: corolla yellow or rarely cream-coloured . . . . . (57) *melanosticta*
- Bracts above the middle of the peduncle.
- Sepals with several apical calli extending to the middle or below.
- Bulb tunics lanceolate, apiculate, very numerous, shining, loose, not adhering closely to the bulb: leaves glabrous.
- Medial leaflet rotund: corolla yellow or white . . . . (101) *Sonderiana*
- Medial leaflet cuneate-obcordate, longer than broad: corolla yellow . . . . . (100) *ausensis*
- Bulb tunics not as above.
- Leaflets over 1 cm. long, clothed with shining strigose hairs on both sides: corolla rose-red. A robust plant . . . . . (37) *strigosa*
- Leaflets glabrous, less than 9 mm. long: corolla white.
- A small slender plant . . . . . (102) *inconspicua*
- Sepals with 2 small apical calli or the calli inconspicuous or wanting.
- Leaves numerous: longer filaments edentate, the longest reflexed at the apex: leaflets broadly obcordate . . (38) *zeekoevleyensis*
- Leaves rather few: longest filaments not reflexed at the apex.
- Leaflets oblong-obovate: hairs on the upper part of the styles pluricellular: longer filaments edentate (105) *tenella*
- Leaflets rotund with a narrow cartilaginous margin, rough cellulose and greyish above when dry: hairs on upper part of the styles not pluricellular: longer filaments toothed . . . . . (104) *commutata*

GROUP 11. Leaflets oval, elliptical or ovate. Corolla rosy or mauve.

- Corolla rosy-mauve with a purple "eye" in the throat: petals marked with orange calli about the margin: ovary callose . . . . . (109) *callosa*
- Corolla without a purple "eye" in the throat: petals ecallose.



Leaves very numerous (100 or more): leaflets undulate at the margin, densely clothed with interwoven villose hairs, greyish .. .. (110) *hirsuta*

Leaves less numerous, leaflets not undulate, glabrous or pubescent, green.

Leaves up to 45 in number; leaflets ovate-rotund with a conspicuous row of calli near the margin beneath: peduncle ebracteate: ovary chambers 3-4-ovuled .. .. (108) *petiolulata*

Leaves up to 5 in number: leaflets ovate with minute black dots spread all over the under side: peduncle bibracteate: ovary chambers 1-ovuled .. .. (107) *Stokoei*

GROUP 12. Water plants. Petiole winged at the base. Corolla widely campanulate.

Stem thick, branched, scaly: leaves and peduncles cauline (91) *disticha*

Stem slender: leaves in apical floating tufts: peduncles apical .. .. (92) *natans*

GROUP 13. Sub-section PARDALES. Leaflets and sepals striate with pellucid lines which turn black in drying. Bulb tunics clothed with retrorse hairs.

Leaflets 5-9: corolla red, white or yellow .. .. (119) *capillacea*

Leaflets 3.

Leaves petiolate, arising from the apex of the stem: peduncles apical, rarely in the axils of the stem scales.

Petals more than 6 mm. broad, obovate, tapering to a distinct claw in the lower half: outer bulb tunics retrorsely pilose: rhizome glabrous.

Sepals 2-3 mm. long: corolla copper, reddish, white or yellow .. .. (120) *leptogramma*

Sepals 5-6 mm. long: corolla pale rose .. .. (119) *capillacea*, var. *ternata*

Petals less than 4 mm. broad, cuneate, without a distinct claw: outer bulb tunics retrorsely velvety: rhizome glandular-pilose: corolla white .. .. (121) *lineolata*

Leaves mostly sessile or subsessile, imbricating on the stem or at least the upper part: peduncles all axillary.

Outer bulb tunics closely plicate: leaflets somewhat glaucous: petals rose-tipped or yellow .. .. (122) *Massoniana*

Outer bulb tunics smooth: leaflets not glaucous.

Tube of the corolla shorter than the laminae: longest filaments or styles well exerted from the tube: corolla rose-red .. .. (123) *melanograptia*

Tube of the corolla narrower, about as long as the laminae: filaments and styles not exerted or in *O. grammophylla* very shortly exerted.

\*Leaves all subsessile, more or less reflexed.

Rhizome pilose: corolla red .. .. (124) *camelopardalis*

Rhizome glabrous.

Stout erect plants with a long woody leafy stem.

Petals more than 7 mm. broad, obovate, tapering to a distinct claw in the lower half: corolla red .. .. (125) *confertifolia*

Petals less than 5 mm. broad, cuneate or oblanceolate without a distinct claw: corolla white .. .. (126) *heidelbergensis*

Dwarf plants.

Stem leafy on the upper part only: ovary chambers 2-3-ovuled: corolla yellow or red (?) .. .. (127) *pardalis*



- ††Hairs pluricellular, glandular-capitate, with shorter simple hairs admixed.
- Sepals 7 mm. long or more: leaves not emarginate: ovary densely cano-pilose on the upper half .. .. (134) *Meisneri*
- Sepals less than 6 mm. long: leaflets emarginate or incised at the apex: ovary not densely cano-pilose.
- Tunics of the bulb dry, easily separable.
- Tube of the corolla broadly funnel-shaped; petals narrowing cuneately to the base: leaflets linear-cuneate: peduncle bibracteate: teeth on longer filaments broad .. .. (135) *viscosa*
- Tube of the corolla narrower; petals with a distinct claw: teeth on longer filaments narrow.
- Herbaceous parts distinctly viscous: peduncles ebracteate.
- Leaflets obovate flat: peduncles all axillary .. .. (191) *ebracteata*
- Leaflets linear, conduplicate: some of the peduncles apical .. .. (192) *neglecta*
- Herbaceous parts sparsely glandular-pilose and scarcely viscous: peduncles bibracteate.
- Stem simple: leaflets linear or linear-cuneate .. .. (144) *reticulaulis*
- Stem branching: leaflets broadly cuneate .. .. (166) *versicolor*, var. *latifolia*
- Tunics of the bulb gummy and not separable.
- Corolla glabrous, the tube swollen towards the apex: leaves all subsessile: peduncles ebracteate .. .. (137) *Leipoldtii*
- Corolla glandular, the tube not as above: upper leaves usually shortly petiolate.
- Corolla tube deep purple, funnel-shaped: claw as long as or slightly shorter than the lamina of the petal: peduncle usually ebracteate .. .. (136) *porphyriosiphon*
- Corolla tube yellow, sometimes with narrow purple longitudinal streaks, sub-cylindrical: claw of the petal longer than the lamina: peduncle bibracteate .. (138) *giftbergensis*

GROUP 15. Stem not leafy or rarely with a few leaves. Bracts 2, opposite, set at the upper articulation of the peduncle.

- Stem long, slender, wiry: leaflets pendulous, linear or linear-oblong, conduplicate.
- Stem brown, polished: sepals acute, with 2—4 elongate calli .. .. (46) *duriuscula*
- Stem green, pubescent: sepals obtuse with numerous calli .. .. (47) *pendulifolia*
- Stem and leaflets not as above (except leaflets sometimes conduplicate in *O. obtusa*).
- Leaflets oblong, undulate at the margin .. .. (42) *crispula*
- Leaflets not undulate.
- Bulb angled and pitted: hairs on peduncles retrorse: leaflets often conduplicate .. .. (33) *obtus*
- Bulb not angled and pitted: retrorse hairs confined to the junction of the peduncle with the calyx, or none.
- \*Leaflets broadly obovate: bulb not glabrous.
- Stem hirsute, simple: leaves apically congested: leaflets adpressed-pubescent above: bulb lanate .. (34) *lanata*

- Stem nearly glabrous, branching: leaves whorled;  
 leaflets glabrous above: bulb puberulous .. (45) *incarnata*
- \*\*Leaflets oblong, cuneate-oblong, rhomboid or rotund:  
 bulb glabrous.
- Stem branched: bracts conspicuous, callose at the  
 apex and more or less imbricating the calyx:  
 petals 1.5 cm. long or less, white .. (39) *virginica*
- Stem not branched or none: bracts minute, remote:  
 petals 1.5 cm. long or more.
- Leaves 3—8; leaflets rhomboid: plant nearly  
 glabrous: corolla yellow .. (41) *rhomboidea*
- Leaves numerous: leaflets oblong or rotund:  
 plant pubescent: corolla white or yellow .. (40) *ambigua*

GROUP 16. Hairs pluricellular, long, not gland-tipped, without simple hairs admixed.

Corolla yellow: ovary with glandular hairs on the upper  
 part.

- Stem usually 5—10 cm. long: outer bulb tunics light  
 brown, twisting and undulate: longer filaments  
 edentate .. (145) *Pillansiana*

- Stem 1—3 cm. long or wanting: outer bulb tunics dark  
 brown, not undulate: longer filaments with short  
 obtuse teeth .. (146) *argillacea*

Corolla reddish, pale mauve or white.

- Leaflets obreniform, attenuate towards the base, never  
 conduplicate, impresso-punctate when dry: ovary  
 glandular: filaments edentate .. (60) *attaguna*

- Leaflets not as above: ovary glabrous: longer filaments  
 toothed .. (147) *adspersa*

GROUP 17. Leaflets obcordate, cuneate-obcordate or elliptical, not twice as long as  
 broad.

Stem conspicuously branched.

- Plant glandular-pilose .. (98) *campylorrhiza*

- Plant not glandular-pilose .. (182) *reclinata*

Stem not normally branched.

- Base of the petiole dilated, with conspicuous stipuliform  
 wings: plant fleshy: leaflets impresso-punctate when  
 dry .. (59) *converula*

Base of the petiole not winged: plant not fleshy: leaflets  
 not as above.

- Sepals ovate, obtuse .. (99) *amblyosepala*

Sepals more or less lanceolate.

Leaves with simple hairs only: longer filaments  
 edentate.

- Petals oblanceolate: hairs on styles simple:  
 capsule not exerted .. (106) *aridicola*

Lamina of petal obovate, tapering to a distinct claw:  
 hairs on upper part of the styles pluricellular:

- capsule exerted .. (105) *tenella*

Leaves with gland-tipped hairs: longer filaments

- toothed .. (144) *recticaulis*

GROUP 18. Bulb acutely angled and pitted.

Corolla yellow, the tube wide; petals narrowing cuneately  
 to the base: teeth on longer filaments less than 0.3 mm.

- long .. (159) *involuta*

Corolla pale mauve or white, often red-margined beneath,  
 the tube rather narrow; petals with a distinct claw:

- teeth on longer filaments more than 0.5 mm. long .. (160) *goniorrhiza*



## GROUP 19. Bulb small, smooth, not more than 1 cm. long.

- Plant bearing glandular hairs: longer filaments edentate .. (181) *Comptonii*  
 Plant not bearing glandular hairs: longer filaments toothed.  
 Claw  $\frac{1}{2}$  the length of the petal: corolla pale yellow, or in  
 var. *pellucida* orange .. (161) *fragilis*  
 Claw  $\frac{1}{2}$  the length of the petal: corolla red, pink or white.  
 Bulbils produced on lateral stolons or runners from  
 the rhizome: sepals very sharply acute, pale brown,  
 usually ecallose .. (163) *glabra*  
 Bulbils if any sessile: sepals subacute, green, bicalllose.  
 Sepals pubescent, ciliate: teeth on longer filaments  
 narrow, about 0.5 mm. long .. (162) *pallens*  
 Sepals almost glabrous: longer filaments gibbous or  
 with very short teeth .. (164) *pusilla*

## GROUP 20. Corolla tube hypercrateriform, densely pubescent.

- Longest styles or stamens well exerted from the corolla  
 tube: stem not normally branched.  
 Leaflets distinctly tapering to the apex, falcate, glabrous  
 above: bulb elongate, lanceolate in outline: plant  
 softly pubescent .. (148) *primuloides*  
 Leaflets not or scarcely tapering to the apex: bulb ovoid.  
 Herbaceous parts hirsute: leaflets glabrous above .. (149) *linearis*  
 Herbaceous parts softly pubescent: leaflets pubescent  
 above .. (151) *exserta*  
 Longest styles or stamens not exerted from the corolla tube:  
 stem usually branched: leaflets scarcely tapering to  
 the apex: bulb ovoid: plant softly pubescent.. (182) *reclinata*, var.  
*gracillima*

## GROUP 21. Corolla tube more or less funnel-shaped. Stem corticate polished, brown.

- Fruiting capsule elongating well beyond the calyx: stem  
 and branches straight or slightly undulate, reddish-  
 brown: corolla salmon, white, red or lilac .. (152) *gracilis*  
 Fruiting capsule globular, not exerted: stem spiral or con-  
 spicuously undulate, light brown: corolla dark ruby  
 red or white .. (153) *helicoidea*

## GROUP 22. Fruiting capsule elongating well beyond the calyx.

- Styles with pluricellular hairs on the upper part: ovary callose.  
 Stem glabrous .. (154) *campicola*  
 Stem pubescent.  
 Leaflets linear: corolla yellow .. (156) *xantha*  
 Leaflets cuneate or cuneate-obovate: corolla white,  
 very rarely yellow .. (105) *tenella*  
 Styles without pluricellular hairs: ovary ecallose.  
 Peduncle with at least some glandular or pluricellular hairs.  
 Glandular hairs confined to the peduncle only .. (157) *tenuipes*  
 Whole plant more or less glandular.  
 Leaves linear-cuneate or oblong-cuneate: bulb lanceo-  
 late in outline, 5—7 cm. long .. (190) *suteroidea*  
 Leaves linear: bulb 2 cm. long or less.. (193) *tenuis*  
 Peduncle not as above.  
 Corolla white: longer filaments toothed.. (155) *stenopetala*  
 Corolla reddish: longer filaments edentate .. (158) *phloxidiflora*

## GROUP 23. Fruiting capsules globular or elliptical.

- Margins of leaflets bordered with pellucid streaks which  
 turn black in drying.

- Plant glabrous: corolla white . . . . . (173) *stictocheila*  
 Plant pubescent: corolla pale violaceous. . . . . (172) *perineson*  
 Margins of leaflets not as above.  
 Corolla yellow.  
   Plant glandular-viscid: leaflets clavate. . . . . (187) *clavifolia*  
   Plant not glandular: leaflets linear . . . . . (166) *versicolor*, var. *flaviflora*  
 Corolla not yellow.  
 †Leaflets with 2 apical calli, sometimes with a row of calli near the margins.  
   Peduncles all axillary: stem sometimes branching:  
     plant glandular-pilose . . . . . (166) *versicolor*, var. *latifolia*  
   Peduncles normally terminal, sometimes 1—2 cauline.  
   Plant glandular-pilose.  
     Leaflets densely silky-villous beneath: petals rose-red . . . . . (189) *droseroides*  
     Leaflets glabrous or sparsely pubescent beneath: petals white or pale violaceous . . . . . (144) *recticaulis*  
   Plant not glandular (in *O. versicolor* sometimes with gland-tipped hairs on the sepals and upper part of the peduncle).  
   Petals with a reddish-purple border beneath: bulb tunics blackish, smooth.  
     Plant silky-villous with white hairs: sepals narrow-cuneate, tapering regularly to the apex, or acuminate . . . . . (171) *argyrophylla*  
     Plant more or less pubescent: sepals oblong-lanceolate with 2—4 apical calli . . . . . (166) *versicolor*  
   Petals with a pale border beneath or the lamina concolourous: bulb tunics brown, or if black, then hard, gummy and inseparable.  
     Leaflets narrow-cuneate, usually less than 1 cm. long: bulb tunics hard, brown, pitted . . . . . (169) *gracilipes*  
     Leaflets narrow-linear, usually more than 1 cm. long: bulb tunics soft, brown, papery or sometimes black, gummy and inseparable.  
       Sepals lanceolate or oblong-lanceolate . . . . . (167) *polyphylla*  
       Sepals acuminate or tapering regularly to the apex . . . . . (167) *polyphylla*, var. *pubescens*  
 ††Leaflets without apical calli.  
   Stem branching.  
     Plant glandular-pilose, sometimes with axillary peduncles: sepals obtuse . . . . . (144) *recticaulis*  
     Plant not glandular-pilose: sepals acute.  
       Leaves and peduncles all terminal on the branches: corolla salmon or violaceous . . . . . (182) *reclinata*  
       Leaves both cauline and terminal: peduncles axillary and terminal. (*Type worthless, grazed and abnormal, without locality.*) . . . . . (183) *linoides*  
   Stem not normally branching.  
     Leaflets with a penicillate tuft of white hairs at the apex, glaucous, acute . . . . . (180) *Creaseyi*  
     Leaflets without a penicillate tuft.  
       \*Ovary bearing calli: leaflets with numerous small callose dots, particularly towards the apex.  
       †Hairs on upper half of the styles pluricellular.  
         Stem glabrous: lamina of the petal obovate: bulb ovoid, simple . . . . . (154) *campicola*  
         Stem pubescent.

- Petals narrow-oblongeolate: bulbs compound, lanceolate in outline: sepals bicallose at the apex, 2.5—3 mm. long (179) *blastorrhiza*
- Petals more or less cuneate: bulb ovoid, simple: sepals ecallose, 4—5 mm. long (178) *oreophila*
- ††Hairs on upper part of the styles gland-tipped.
- Tube of the corolla subcylindrical, longer than the free part of the narrow-oblongeolate petals .. .. (106) *aridicola*
- Tube of the corolla funnel-shaped, not longer than the laminae: petals with a distinct claw.
- Leaflets ciliate: corolla tube more or less pubescent .. .. (175) *ciliaris*
- Leaflets not ciliate: corolla tube glabrous (176) *Burkei*
- \*\*Ovary ecallose: leaflets not as above: sepals ecallose (or in *O. levis* inconspicuously bicallose at the apex).
- Lamina of the petal suborbicular, as long as the claw: corolla red .. .. (165) *leptocalyx*
- Lamina of the petal obovate, longer than the claw, or the petals more or less cuneate.
- Sepals lanceolate.
- Plant without capitate or pluricellular hairs.
- Leaflets glabrous, narrow-linear, emarginate: corolla white .. .. (174) *levis*
- Leaflets more or less hairy.
- Leaflets cuneate, obtuse, emarginate, pubescent, above and below: corolla white .. .. (177) *cuneata*
- Leaflets linear, acute or tapering towards the apex, glabrous above, corolla pink .. .. (170) *falcata*
- Plant with capitate or pluricellular hairs.
- Plant finely pubescent, with longer capitate hairs admixed .. .. (193) *tenuis*
- Plant clothed with long pluricellular capitate hairs only .. .. (188) *deserticola*
- Sepals narrow-cuneate, tapering regularly towards the apex, or acuminate.
- Plant sparsely hairy: bulb tunics smooth, separable .. .. (198) *variifolia*, var. *ternata*
- Plant rather densely pubescent: bulb tunics gummy, inseparable and the bulb irregularly shaped .. .. (167) *polyphylla*, var. *pubescens*.

## GROUP 24. Leaflets 4—29.

Leaflets 23—29: peduncles flattened .. .. (199) *palmifrons*

Leaflets 20 or less: peduncles terete.

Scales enclosing the bases of the petioles large, ovate, cuspidate, brown: petioles conspicuously articulated to the much widened or winged base; apex of the petiole suddenly widened: stem not exerted: plant readily falling apart at the articulations in the dried state.

Peduncles with gland-tipped hairs: leaflets 8—12, linear, emarginate, thin: ovary minutely glandular on the upper part: longer filaments prominently gibbose: petals white, or lemon yellow .. .. (112) *cathara*

Peduncles glabrous: leaflets 4—13, moderately thick, sometimes with a cartilaginous margin: ovary glabrous: longer filaments obtusely toothed: petals yellow or very pale violaceous.

- Petals with a bright red swelling at the base: filaments bright red below the teeth: sepals ecallose: petioles pulvinate at the base .. .. (113) *pulvinata*
- Petals, filaments and petioles not as above.
- Sepals oblong or lanceolate-oblong, obtuse or sub-obtuse: leaflets glabrous: tube of the corolla rather narrow .. .. (114) *flava*
- Sepals lanceolate, acute or attenuate: leaflets usually clothed with very short patent hyaline hairs: tube of the corolla wide.. .. (115) *flaviuscula*
- Scales and petioles not as above.
- Leaflets 4—7, linear: leaflets and sepals striate with pellucid lines which turn black in drying: bulb tunics clothed with retrorse hairs: corolla rose, yellow or white with a purple margin.. .. (119) *capillacea*
- Leaflets not striate: bulb tunics glabrous.
- Plant densely villous: leaflets 12—20 .. .. (200) *tomentosa*
- Indument not as above.
- Stemless: hairs on petioles and peduncles retrorse: bulb acutely angled and pitted: leaflets 5 .. (33) *obtusa*, var. *atrata*
- Stem exserted: hairs and bulb not as above.
- Peduncles axillary .. .. (195) *Henrici*
- Peduncles usually all terminal.
- Leaflets (narrow-linear) with 2 conspicuous apical calli: sepals bicallose.
- Leaflets mostly 5 .. .. (167) *polyphylla*, var. *pentaphylla*
- Leaflets mostly 7.
- Corolla yellow .. .. (168) *Burtoniae*
- Corolla not yellow .. .. (167) *polyphylla*, var. *heptaphylla*
- Leaflets and sepals ecallose.
- Stem branched .. .. (182) *reclinata*, var. *quinata*
- Stem not branched.
- Stem elongate, corticate, light brown: leaflets 5—9: plant often glandular-pilose: outer bulb tunics undulate: longer filaments toothed .. .. (194) *Engleriana*
- Stem not as above.
- Plant more or less glandular-pilose: leaflets 5—15: bulb lanceolate in outline, with tunics vertically grooved: sepals 3—4 mm. long: longer filaments gibbose: petals rosy-mauve .. .. (196) *Zeyheri*
- Plant not glandular-pilose: leaflets 5—11: bulb ovate with hard smooth tunics: sepals 5—12 cm. long: petals pale mauve.
- Sepals 8—12 mm. long, about  $\frac{1}{3}$  the length of the corolla: leaflets 5—10, hirsute: teeth on filaments truncate .. .. (197) *amblyodonta*
- Sepals 5—8 mm. long, about  $\frac{1}{4}$  the length of the corolla: leaflets 3—5, pubescent: teeth on the filaments acute or wanting.
- Leaflets narrow-linear, more than 1 cm. long .. .. (198) *variifolia*
- Leaflets cuneate-obovate, less than 1 cm. long .. .. (150) *quinata*



## Sect. A. CORNICULATAE.

Plant without a bulb: peduncle more than 1-flowered. Seeds endospermous.

1. **O. corniculata** L. Sp. Pl. I (1753) 435.—*O. repens* Th. (*Further synonymy omitted*). A creeping softly hairy much branched annual. *Roots* fibrous, without a bulb. *Stems* weak, procumbent, 10–30 cm. long. *Leaves* cauline or terminal: petioles winged below the basal articulation: leaflets very broadly cuneate-obcordate or sub-bilobed,  $1/3$ – $1/2$  incised, the sinus narrow, usually 0.6–2 cm. long, 1–2.5 cm. broad, glabrous above, pilose below, ciliate, sensitive to light. *Peduncles* axillary, 1–6 fld., as long as or longer than the leaves. *Sepals* oblong-lanceolate, ecallose, about 5 mm. long. *Corolla* about 7 mm. long, yellow, the tube funnel-shaped: petals narrow-cuneate. *Filaments* glabrous, edentate. *Ovary* chambers many-ovuled: styles pubescent. *Capsule* oblong, acute, 5-angled, adpressed-pubescent with reversed hairs, exserted beyond the calyx, up to 2 cm. long.

A cosmopolitan weed which is widely distributed in South Africa. It is the only species without a bulb and the flowers are homomorphous only the medio-stylar form occurring. The variations in this plant form a special study. I have treated it here in the Linnean sense, though it has been greatly sub-divided by later botanists. It is freely represented in herbaria and so unmistakeable that it is not considered worth while to cite specimens.

It is interesting to note that it has penetrated as far as the lonely island of Tristan da Cunha. The specimens (*Dyer* 3535) are dwarf and in fruit and the peduncles are all 1-flowered.

## Sect. B. IONOXALIS.

Underground stem reduced to a disc, the leaves and peduncles having bases modified to form nutritive bulb scales. Flowers umbellate.

2. **O. latifolia** Humboldt, Bonpland & Kunth, Nov. Gen. et Spec. V (1821) 184, t. 467. Rather lax, stemless 15–25 cm. high. *Bulb* ovoid or globose, 1–1.5 cm. long: scales brown, the outer few, protective only, papyraceous, ciliate, the inner all nutritive, vertically ridged: bulbils numerous, produced on short runners from the base of the bulb. *Rhizome* none. *Leaves* 1–5, basal: petioles 8–18 cm. long, arising from the scales of the bulb, like the peduncles glabrous or very sparsely villose: leaflets 3, with very short villose petiolules, very broadly obdeltoid,

widely incised on the upper margin, 1—2·5 cm. long, 2—4·5 cm. broad, the lobes broadly ovate-obcuneate, obtuse at the apex, sometimes sparsely ciliate. *Peduncles* 6—13 fld., rather longer than the leaves: pedicels glabrous, 1—2 cm. long. *Sepals* lanceolate-oblong, 4—5 mm. long, with 2 conspicuous orange-brown apical calli. *Corolla* 1·1—1·6 cm. long, violaceous, with a short widely funnel-shaped greenish striate tube: petals widely cuneate, rounded at the apex, 6—7·5 mm. broad. *Filaments* pubescent, the longer shortly and obtusely dentate. *Ovary* glabrous, the chambers 6—8-ovuled. (See Plate III (ii), opp. p. 84).

TRANSVAAL: *Smith* 1828, *Verdoorn* 762, *Leeman*, *Gilmore* 1718, *Thode* 2795. ORANGE FREE STATE: *Pole-Evans*, *Pont* 338. NATAL: Durban, *Rogers* 1475, *Tennant* 3358. QUEENSTOWN, *B.H.* 16491. As a weed at Nat. Bot. Gar., Kirstenbosch, *S* 2677. Fl. Feb.—Apl.

Introduced from Mexico: a troublesome weed of cultivation. Often confused with *O. semiloba* in South African herbaria.

#### Sect. C. CERNUAE.

Peduncle several-flowered in a cymose umbel, or in *O. anomala* and *O. copiosa* 1—2 flowered: stemless or caulescent: leaflets usually bilobed or conspicuously incised: bulbs various. Seeds endospermous.

The species in this Section are placed together on account of the obvious floral character, but they are only related to one another in the individual subsections. The bulb and root system are very important factors in their determination.

The umbellately flowered species are generally accepted as the primitive type in the genus, but this section merges gradually into Section D, Oppositae, where *O. psilopoda* Turcz., though 1-flowered, is closely related to the subsection Stellatae.

The key to these plants will be found in Group I in the Analysis of the Species.

For fuller notes on this section see *Journ. of S.A. Botany* VI (1940) 11—19.

#### SUB-SECT. (i) EU-CERNUAE.

Flowers yellow. (Sp. 3—9).

3. *O. compressa* L.f. Supp. (1781) 243. Rather robust, stemless 12—25 cm. high. *Bulb* oblong-ovoid, attenuate-acute at the apex, 2·5—3 cm. long: tunics brown, the outer longitudinally ridged. *Rhizome* long, succulent. *Leaves* 10—30, basal: petioles 3—8 cm. long, com-

pressed or narrowly alate, villosa-pubescent, dilated, membranous and 3-nerved below the articulation: leaflets 3, with very short pilose petioles, broadly cuneate-<sup>obcordate</sup>obovate, glabrous or rarely pubescent above, softly pilose below, ciliate, often purple-zoned, the medial 1.1—3.5 cm. long, 1.5—3 cm. broad, the lateral oblique, rather smaller. *Peduncles* several, 2—6 fld., 10—18 cm. long, like the pedicels softly pilose: bracts linear-lanceolate, orange-callose on the upper part: pedicels often 2 cm. long. *Sepals* lanceolate, 5—7.5 mm. long, more or less villosa-pubescent. *Corolla* 1.5—2 cm. long, yellow, with a rather widely funnel-shaped tube: petals broadly cuneate, rounded at the apex, slightly attenuate towards the base. *Filaments*, the shorter 2—4 mm., the longer 3.5—7 mm. long, glandular-pilose with broad teeth. *Ovary* pubescent on the upper half, the chambers many-ovuled. Capsule elongating beyond the calyx. Seeds endospermous.

CAPE PENINSULA.; *E. & Z.* 659, *Zey.* 4772, *MacO.* 1739, *Bolus* 3811, *B.H.* 14627, 14746, 15022, *S.* 245/20, 1301: MALMESBURY DIV.; *Bolus* 12634, *S.* 1312. *Pillans* 6975: WELLINGTON DIV.; *Moss* 3061: PIQBG. DIV.; *S.* 2607: CALEDON DIV.; *B.H.* 20070: NAMAQUALAND; Kamiesberg, *Marl.* 6728. Fl. July-Sep.

Var *β purpurascens* Salter. *Folia* minora, procumbentia: foliola subtus purpurea, in nervo medio solum pilosa. *Pedunculi* 7—9 cm. longi, 2—3-flori. *Sepala* 7—9 mm. longa, saepe purpurascencia. *Petala* aurea, subtus interdum purpureo-marginata.

Leaves rather smaller, procumbent: leaflets purplish below and pilose on the midrib only. *Peduncles* 7—9 cm. long: <sup>pedicels</sup>petioles 2—3. *Sepals* 7—9 mm. long, often purple-tinged. *Petals* golden yellow, sometimes purple-margined below.

V.R.'s DORP DIV.; 9 miles north-east of V.R.'s Dorp, *Salter* 2503 (*type* in *Bolus* Herb.), *Pillans* 7293, *Schltr.* 8328.

Distinguished by its flattened petioles. It is not by any means confined to sandy and wet places as stated by Sonder and it is probably more widely distributed than is supposed, for it is very easily mistaken for the very common *O. pes caprae* L. The corolla in var. *β* is deeper yellow than that of the typical form.

4. *O. pes caprae* L. Sp. Pl. I (1753) 434.—*O. cernua* Th.\*—*O. cernua* Th., var. *namaquana* Sond.—*O. Burmanni* Jacq.—*O. kuibisensis* R. Knuth. The *type* is Burmann Afr. (1738) 74, t. 29. Stem usually not exerted, of if exerted naked. Plant more or less sparsely pubescent or villose, often with glandular hairs on the pedicels and sepals. *Bulb* ovate-oblong, attenuate at the apex, up to 2.5 cm. long, 1 cm. broad:

\*For reversion to the original name *O. pes caprae* L. from the better-known name *O. cernua* Th. see Journ. of S.A. Bot. V (1939), 47.

root contractile : tunics rather pale brown, indistinctly longitudinally ridged. *Rhizome* long, thick and fleshy in the upper part. *Leaves* 10—40 : petioles usually 3—12 cm. long : leaflets very broadly cuneate-obcordate, sub-bilobed, or more rarely triangular in outline, deeply bilobed, often purple zoned or spotted, usually glabrous above, sparsely villose below. *Peduncles* up to 30 cm. long, 3—20-fld., twice as thick as the petioles : bracts linear, usually callose-tipped : pedicels 0.5—2 cm., long, articulate near the base, like the sepals often glandular-pilose. *Sepals* lanceolate or oblong-lanceolate, 5—7 mm. long, often with 2 orange apical calli. *Corolla* yellow, rarely cream-coloured, 1.5—2.5 cm. long, with a broadly funnel-shaped concolourous tube : petals broadly cuneate, obliquely subtruncate at the apex. *Filaments*, the shorter 3—4.5 mm., the longer 5—7 mm. long, glandular-pilose, with prominent teeth. *Ovary* oblong, pubescent on the upper half, the chambers usually 9-ovuled : styles with simple and glandular hairs admixed. Capsule exserted. Seeds endospermous.

FORM A. Leaflets broadly cuneate-obcordate, sub-bilobed.

CAPE PENIN. ; *E. & Z.* 657, *MacO.* 1812, *Bolus* 7244, *Schltr.* 1503, *W-Dod* 62, 1760, *S.* 245/21, 1004, 6815, 6816, 6829, 6856, 7743 (cream), 7744 : MALMESB. DIV. ; *Pillans* 6882 : PIQBG. DIV. ; *Pillans* 7388, 7727 : CLANW. DIV. ; *Pillans* 9040 : BREDASDORP DIV. ; Cape Agulhas, *S.* 4818 : KNYSNA DIV. ; *Duthie* 1223 : GRAAF REINET ; *Bolus* 499 : S.W. AFRICA, Kuibis ; *Range* 972 (*O. kuibisensis* R. Knuth. Fl. June-Oct.

FORM B. Leaflets triangular in outline, deeply lobed, the lobes narrower.

NAMAQUALAND ; Kamieskroon, *S.* 825, *S.A.M.* 48785 : V.R.'s DORP DIV. ; *S.* 698, 5358, 5489 ; Bitterfontein *S.* 940, 943, 5492, 6640 : CALVINIA DIV. ; *S.* 7341, *B.H.* 19807, *Johanssen* (S.A.M. 14504) : CLANW. DIV. ; *Schltr* 7992, *B.H.* 20192, *S.* 684, 2458, 6116, 7242, *Pillans* 6651 : CERES DIV. ; Karroo Poort ; *S.* 2641 : WORCES. DIV. ; *S.* 6849 : MONTAGU ; *S.* 1092. Fl. May-Aug.

Var.  $\beta$  *sericea* (L.f.) Salter.—*O. sericea* L.f.—*O. sericea* L.f., var. *glandulosa* Weintroub. Leaflets more or less silky-pubescent on both sides. *Sepals* linear-lanceolate, rarely bicallose at the apex. *Corolla* usually smaller. Rarely glandular-pilose on all parts.

CAPE PENIN. ; Lion's Head, *E. & Z.* 658, *Zey.* 220, *MacO.* 1816, *Bolus* 3954, *W-Dod* 1062, *B.H.* 15021, *S.* 245/19, 501, 6602, 8085, 8086 : CAPE DIV. ; *S.* 561, 6591, 7184 : MALMESB. DIV. ; *Bolus* 12635, *B.H.* 14559, *S.* 8632 : PIQBG. DIV. ; *S.* 383/17 : CLANW. DIV. ; *B.H.* 14621, *S.* 754, Pakhuis Pass, *Leipoldt* (B.H. 19229, var. *glandulosa* Weintroub, *S.* 8129, 8136 (cream) : V.R.'s DORP DIV. ; *S.* 713, 2147,



Gift Berg, *P. Sladen Mem. Ex.* 6572, *S.* 7289 (glandular): CALVINIA DIV.; *S.* 7341: CERES DIV.; *S.* 4717: STELLENBOSCH DIV.; *S.* 5273: PAARL DIV.; *S.* 6002, 6622: WELLINGTON DIV.; *S.* 4501: TULBAGH DIV.; *S.* 6093: CALEDON DIV.; Sir Lowry Pass, *Schltr.* 7807. Fl. May—July.

A doubtful variety which seems to hybridise with the typical form, the following being possible hybrids:—

CAPE PENIN: Pinelands, *S.* 6601; Wynberg Hill, *S.* 6830: CAPE DIV.; Visser's Hok, *S.* 6808.

Although the common form with large flowers appears to differ from the typical small flowered *O. sericea* (e.g. *E. & Z.* 658, from Lion's Mt.), the examination of a large number of plants from the south-western district, which show intermediate characters, suggests that there is no hard and fast line between the two species, or that the mass of different forms may be (at least partly) the result of past hybridisation. A large colony near Pinelands (suburb of Cape Town) consists of some plants fairly typical of both species, together with many intermediates which have every appearance of being hybrids.

Generally speaking the Little Karroo forms are smaller and have more deeply divided leaflets, while in most forms from the western areas (Clanwilliam to Namaqualand) the leaflets are very deeply bilobed and glabrous above. These forms (Form B.) cannot be preferably assigned to one or the other species, while their characters do not seem sufficiently definite to make their complete separation possible.

In the great majority glandular hairs are present on the pedicels and sepals and sometimes on the whole plant (var. *glandulosa* Weintroub). Exsertion of the stem (often to a considerable length where the plants grow up through other vegetation), purple zonal markings on the leaflets and apical calli on the sepals occur indiscriminately. In both species teratologic forms are found with dissolute umbels of flowers and loosely imbricating bracts (*O. kuibisensis* R. Knuth) and plants with double flowers also occur.

In the Cape Peninsula var. *sericea* commences to flower on Lion's Mt. in May, while the larger typical form flowers normally rather later, but there is considerable overlap in the flowering period.

*O. pes caprae* has now become a troublesome cosmopolitan weed (always near the coast), but it seems certain that it is a native of South Africa.

5. *O. haedulipes* Salter, Journ. of S.A. Botany VI (1940) 5. Slender, sparsely pubescent or glabrous, 15—20 cm. high, the stem often exserted. Bulb narrow-ovoid, up to 3.5 cm. long, with an acute apical beak: root contractile: tunics hard, pale brown or greyish, conspicuously

longitudinally ridged. *Stem* slender, up to 10 cm. long, with a few scales, or sometimes not exerted. *Leaves* fairly numerous, basal or apically congested, rarely 1—2 cauline : petioles very slender, usually 3—6 cm. long, rarely longer : leaflets 3, shortly petiolulate, very broadly cuneate-obcordate or cuneate-bilobed, about  $\frac{1}{3}$  incised, 5—10 mm. long, 0.7—1.4 cm. broad, often livid below, the lobes rounded at the apex. *Peduncles* 1—6, 2—6-fld., 5—15 cm. long : bracts small, lanceolate, orange callose at the apex : pedicels slender, usually 1—2 cm. long, reflexed after flowering. *Sepals* lanceolate, 4—4.5 mm. long, sparsely pubescent, with 2 small orange apical calli. *Corolla* 1.1—1.4 cm. long, yellow, with a broadly funnel-shaped concolorous tube : petals cuneate, rounded at the apex, about 5 mm. broad. *Filaments*, the longest 6 mm. long, with both simple and capitate hairs, acutely toothed. *Ovary* pubescent on the upper half, the chambers about 10-ovuled : styles pubescent. *Capsule* elongate, 0.8—1 cm. long, exerted beyond the calyx. Seeds endospermous. (Fig. 4.)

KALAHARI REGION : GRIQUALAND WEST ; Kimberley, *Esterhuysen* 764 (type in Bol. Herb.), *S.A.M.* 13310, 53373, *B.H.* 14579, 15888 ; Daniel's Kuil, *B.H.* 20390 ; Barkly West, *Acock* 225 ; Langeberg Range, Mt. Toto, *Rennie* (*S.* 5781). Fl. Jan.—Apl.

More slender than *O. pes caprae* L., with a very different bulb.

- ✕ 6. *O. copiosa* Bolus f. Ann. Bol. Herb. II Pt. I (1918) 23.—*O. pusilla* R. Knuth ex parte, non Jacq. Stemless, glabrous or sparsely villose, 6—14 cm. high. *Bulb* oblong-ovoid, acute, about 2 cm. long : tunics rough, conspicuously vertically ridged, very pale brown. *Rhizome* rather long, with numerous pale membranous scales, producing pale brown sessile rostrate bulbils in the scale axils. *Leaves* rosulate, very numerous : petioles up to 8 cm. (often 2—5 cm.) long, widely dilated, submembranous and conspicuously nerved below the articulation : leaflets 3, very broadly obcordate, sub-bilobed, the lobes rounded at the apex, or subobreniform, tapering cuneately at the base, 3—6.5 mm. long, 6—12 mm. broad, entirely glabrous or sparsely villose below and ciliate, impresso-punctate when dried, ecallose. *Peduncles* 1—2-fld., often in the same plant, 3—10 cm. long : bracts linear, opposite, callose towards the apex : pedicels 1—2.5 cm. long. *Sepals* lanceolate or oblong-lanceolate, 6—7 mm. long, submembranous, usually with 2 converging apical calli. *Corolla* 1.6—2.4 cm. long, yellow, with a rather short broadly funnel-shaped tube : Petals subcuneate, slightly attenuate into a short claw, rounded at the apex. *Filaments*, the shorter 3.5—5.5 mm., the longer 5.5—8.5 mm. long, very sparsely glandular, shortly dentate, the longest well exerted from the corolla tube. *Ovary* pubescent towards the apex ; chambers about 15-ovuled : styles pubescent below,

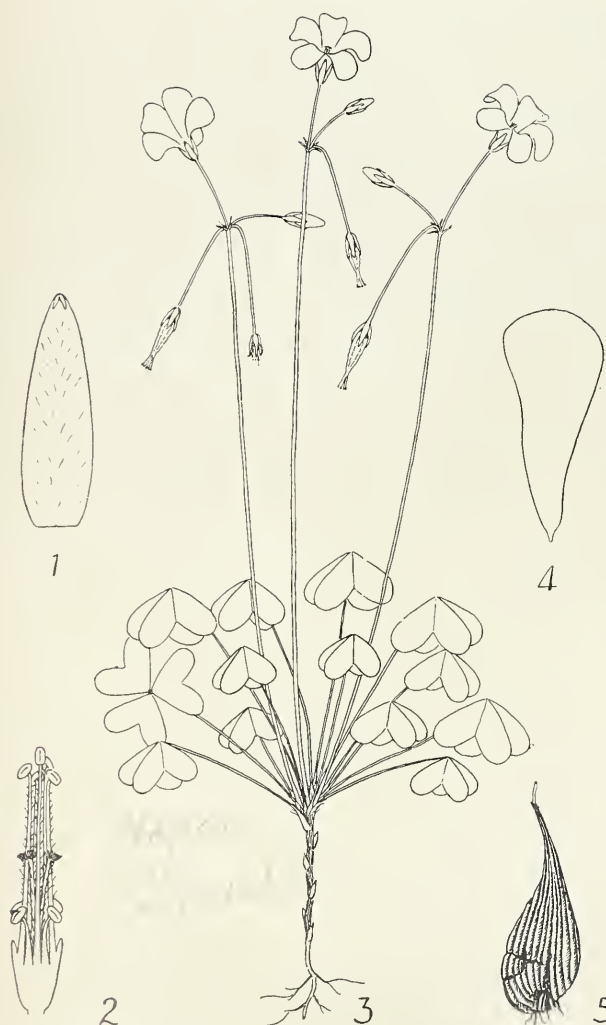


FIG. 4. *Oxalis haedulipes* Salter. 1. Sepal  $\times 8$ . 2. Androecium  $\times 6$ . 3. Plant, natural size. 4. Petal  $\times 3$ . 5. Bulb, natural size.

the longest glandular-pilose above. *Capsule* oblong, up to 1.2 cm. long, exserted from the calyx. Seeds endospermous.

FORM A. Eglandular.

NAMAQUALAND: near Klipfontein, *Bolus* 6653 (*type* in Bol. Herb.); about Misklip, *S.* 2573, 4576, 5602; Witbank, *Pillans* 5220: Anenous, *Schultz* 163, 187a (*O. pusilla* R. Knuth, ex parte). Fl. June—Aug.

FORM B. Petioles, peduncles and sepals clothed with short gland-tipped, often pluricellular viscid hairs. Leaflets glabrous, sometimes sparsely ciliate, narrower than in Form A.

NAMAQUALAND: Messelpad, *L. Bolus* (B.H. 19200). Fl. Aug.

The peduncles in the *type* set are all 1-flowered. The species is, however, an affinity of *O. pes caprae* L., not *O. Smithiana* E. & Z., as suspected by Mr. Bolus.

*O. pusilla* R. Knuth (non Jacq.) comprises two separate species, in part *O. copiosa* and in part the following species *O. Luederitzii*.

7. *O. Luederitzii* Schinz., Bull. Herb. Boiss., 2-sér. VIII (1908) 630—*O. kububensis* R. Knuth—*O. pusilla* R. Knuth, ex parte, non Jacq. Stemless, entirely glabrous. *Bulb* structure narrow-ovoid or narrow-conical, 4—6 cm. long: tunics lanceolate, acuminate, dark brown, with 3 conspicuous longitudinal ridges, often splitting, the older sometimes imbricating on the rhizome through the action of the contractile root. *Leaves* about 8—20; petioles unequal, at most 3—4 cm. long: leaflets reniform, widely incised at the apex, 0.3—1 cm. long, 0.7—1.7 cm. broad. *Peduncles* 2—5-fl., from as long to twice as long as the leaves: bracts linear or lanceolate, rubro-callose at the apex: pedicels 0.5—1 cm. long. *Sepals* lanceolate, 5.5—8 mm. long. *Corolla* 1.2—1.8 cm. long, yellow (or white?). *Filaments*, the longest 6 mm. long, edentate. *Ovary* glabrous, the chambers several-ovuled: styles pubescent.

S.W. AFRICA: Sandy places, Ebene von Tsirub, *Schinz.* an. 1887 (*type*); Luederitz Bay, *Range* 672 or 679, 1848; Kubub, *Range* 267a (*O. kububensis* R. Knuth), *Schultz* 133 (*O. pusilla* R. Knuth, ex p.), *Dinter* 3621, 6124; Tsirub, *Schenk* 87; Kleinfontein, *Dinter* 6261; Halenberg, *Dinter* (*O. halenbergensis*).

Only known to me from dried specimens. In some of these the corolla may have been white.

8. *O. Knuthiana* Salter, Journ. of S.A. Bot. II (1936) 145. Erect, caulescent, robust, branching, almost glabrous, often 20—30 cm., or in shade up to 70 cm. high. *Bulb* ovoid, oblong-ovoid or conical, up to 7 cm. long, with numerous papery tunics, the outer often ligulate, blackish-brown, paler at the margins. *Rhizome* up to 15 cm. long, thick. *Stem* much branched, succulent, 4 mm. in diam. at the base: branches alternate, the lower arising from the axils of cauline scales,



the upper from leaf-axils. *Leaves* petiolate, the lower alternate or rarely binate, the upper usually 2—4 verticillate : petioles up to 5 cm. long : leaflets 3, with short blackish petiolules, pubescent below, minute, but developing after the flowering season, glabrescent, very broadly cuneate-obcordate, widely incised at the apex, up to 3 mm. long, 5·5 mm. broad. *Peduncles* 3—7 fld., axillary or terminal, 3—8 cm. long : bracts up to 3 mm. long, orange-callose at the apex : pedicels 1—1·5 cm. long. *Sepals* ovate-lanceolate, up to 5 mm. long, purplish towards the apex, sometimes minutely penicillate, ecallose. *Corolla* up to 1·3 cm. long, yellow, with a short broadly funnel-shaped concolorous tube : petals subcuneate, more or less rounded at the apex, very obliquely attenuate at the base, up to 8 mm. broad, with a narrow reddish-purple outer margin beneath. *Filaments* minutely glandular, the shorter 2·5—3 mm., the longer 3·5—5·5 mm. long, with very short broad truncate teeth. *Ovary* pilose at the apex, the chambers 2—3-ovuled : styles pilose with simple and capitate hairs admixed. Capsule scarcely exerted. Seeds with thin endosperm, the embryo greenish. (Fig. 5.)

NAMAQUALAND : among rocks and bushes, 13 miles north of Kamieskroon, *S.* 2569 (type in Bol. Herb.) *S.* 5565, *Bolus* 6655, near Garies, *Esterhuysen* 5653, Brakdam, *Compton* 11363. Fl. July.

When growing in the open the plant is somewhat pyramidal in shape. It has retained its habit of flowering before the leaves develop in cultivation, but leaflets up to 9·5 mm. long and 11·5 mm. broad have been produced after the flowering period. The bulbs were invariably found under large stones and in contact with them, embedded in a thick mass of old tunics.

9. *O. Schaeferi* R. Knuth, Eng. Bot. Jahrb. LXI, Beibl. n. 139 (1927) 3. Caulescent, glabrous, branching, up to 18 cm. high. *Leaves* terminally congested on the branches or rarely cauline : petioles usually 2—4 cm. long : leaflets very broadly cuneate-obcordate, shortly petiolulate, 4—7 mm. long, 6—11 mm. broad, the lobes broad, obtuse. *Peduncles* 3—7 fld., cauline or apical, much longer than the leaves : bracts subulate, rusty-callose at the apex : pedicels up to 2 cm. long. *Sepals* broadly lanceolate, 4—5 mm. long, ecallose. *Corolla* 1—1·2 cm. long, yellow. *Filaments* up to 4·5 mm. long, pubescent, the longer toothed. *Styles* pubescent. Seeds endospermous.

S.W. AFRICA : Aus ; *Schäfer* 350 (type—Berlin), *Dinter* 3567 (June), 6082 (Mch.).

A much smaller and more lax species than the foregoing and differing in that the leaves develop at the same time as the flowers. It is only known to me from dried specimens.

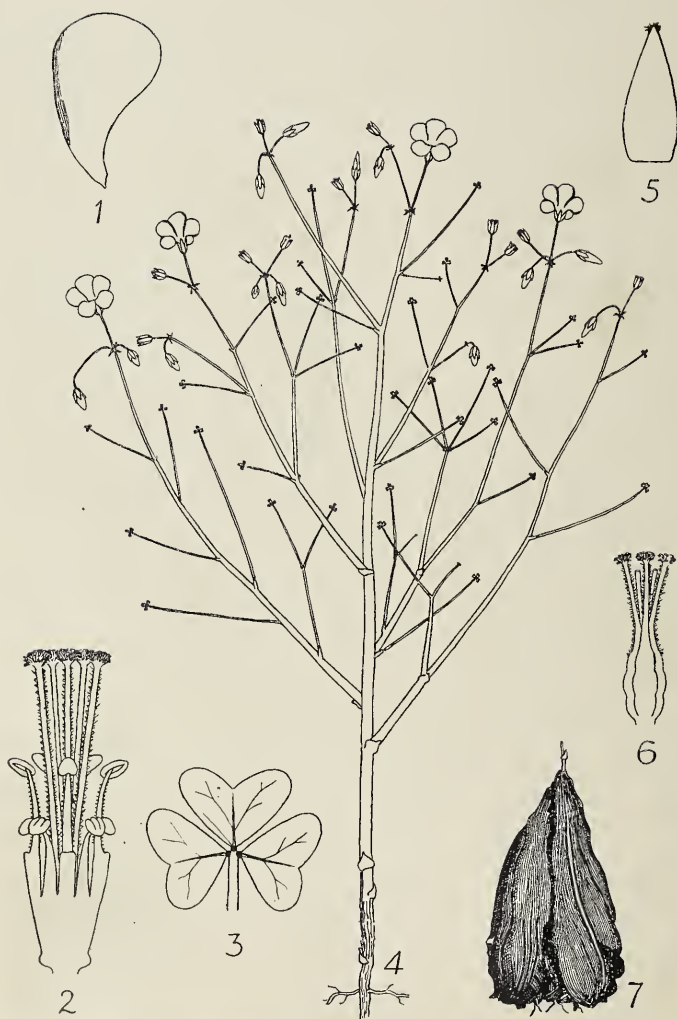


FIG. 5. *Oxalis Knuthiana*, Salter. 1. Petal  $\times 2$ . 2. Androecium  $\times 8$ . 3. A leaf fully developed after the flowering period  $\times 3$ . 4. Plant, half size. 5. Sepal  $\times 4$ . 6. Gynaecium  $\times 8$ . 7. Bulb, half size. (Salter 2569.)



PLATE II.

- (i) *O. dentata* Jacq. A. Plant flowering. B. Contractile root developing. C. New bulb just leaving the old tunics. D. New bulb nearing its final position.
- (ii) *O. latiflora* Jacq. A. Plant flowering. B. Bushy stage after flowering, with the runners well developed. C. Plant after dying off of the leaves. [Photo: R. S. Adanson.





## SUB-SECT. (ii) LIVIDAE.

Caullescent : bulb without an apical beak, the tunics longitudinally ridged, pilose at the apex : peduncles, or at least one, cauline : pedicels and sepals glandular-pilose. (*Sp.* 10—12.).

10. *O. dentata* Jacq. Oxal. (1794) 38, t. 7.—*O. livida* Jacq., var. *dentata* (Jacq.) R. Knuth. Caullescent, 15—30 cm. high. *Bulb* ovoid or narrow-ovoid, 1.5—2 cm. long, lying horizontally : tunics reddish brown, longitudinally ridged, pilose with golden-brown hairs at the apex. *Contractile root acting horizontally*. *Rhizome* short, without lateral runners. *Stem* 1—15 cm. long, glabrous, with a few acutely tipped amplexicaul scales. *Leaves* glabrous, usually 10—20, terminally clustered or 1—2 arising from the upper stem-scales : petioles usually 2—6 cm. long : leaflets 3, shortly petiolulate, up to 0.9 cm. long, 1 cm. broad, cuneate-triangular, lobed to the middle or less, livid below and sometimes sparsely pilose, the lobes broad, obtuse, those of the lateral leaflets unequal. *Flowers* often produced before the leaves develop. *Peduncles* 1—3, cauline or more rarely terminal, 2—6-, commonly 3-fld., 8—14 cm. long, glandular-pilose at least on the upper part : bracts lanceolate, acuminate, callose at the apex : pedicels 1—3.5 cm. long, glandular-pilose. *Sepals* broadly lanceolate or oblong lanceolate, subobtusely, 5—6 mm. long, glandular-pilose, often purple-margined, with 2 conspicuous orange apical calli, very rarely with 1—2 teeth at the apex. *Corolla* 1.3—2 cm. long, glandular, pale lilac, the rather short funnel-shaped tube greenish towards the base : petals cuneate, obliquely subtruncate, slightly attenuate below. *Filaments*, the shorter 2.5—3.5 mm., the longer 4—7 mm. long, usually with a few simple hairs, edentate or very shortly toothed. *Ovary* pubescent on the upper half, the chambers 1—2-ovuled : styles sparsely pubescent. Capsule not exserted. Seeds endospermous.

CAPE PENIN. *E. & Z.* 653 (*O. caprina* E. & Z.) 654, 655 (pars. *dentata*), *Zey.* 108, 121, *Schltr.* 605, *Bolus* 3387, 4651, *B.H.* 14503, *W-Dod* 1057, 2511, *S.* 245/23, 507, 512, 3308, 5239, 5242, 5243, 6026, 8101 : CAPE DIV., Tygerberg ; *S.* 563, 7186 : CALEDON DIV., Onrust, *Schltr.* 10389 (cited in Plfch-Oxal. as *O. caprina*). Fl. Apl.—May.

The character from which Jacquin gave the name *dentata* to this species, viz. the dentate sepals, is rare and quite unimportant. By an unfortunate coincidence his cultivated plant had this uncommon character and quite undeserved importance has been attached to it by later botanists, whose conception of *O. livida* Jacq. has been arrived at from this plant, indeed both Sonder and Knuth have described and cited

specimens of it under the name *O. livida*. (See Journ. of S.A. Bot. VI (1940) 14).

In *O. livida* the contractile root acts vertically, whereas in *O. dentata* it acts horizontally, dragging the newly formed bulb sideways to a distance of several inches, sometimes as much as a foot, from the parent plant. (Plate II (i)).

11. *O. lateriflora* Jacq. Hort Schoenbr. II (1797) 41, t. 204.—*O. phellandroides* E. Mey. ex Meisn. Caulescent, 15—30 cm. high. *Bulb* broadly ovoid, lying horizontally, 1.5—2.5 cm. long, *without* a contractile root : tunics brown, the outer longitudinally ridged, pilose with golden-brown hairs at the apex : bulbils produced on long lateral underground runners. *Stem* often branched, with a few acutely tipped semi-amplexicaul scales. *Leaves* almost glabrous, few or many, mostly terminally clustered or more rarely cauline : petioles usually 1.5—3 cm. long : leaflets 3, shortly petiolulate, 0.5—1 cm. long and broad, triangular in outline, bilobed nearly to the base, livid below, the lobes linear, obtuse. *Peduncles* 1—6, 2—6-fld., cauline or terminal, usually 6—15 cm. long, glandular-pilose towards the apex : pedicels glandular-pilose, 1—3 cm. long. *Sepals* oblong-lanceolate or oblong, obtuse, 4—5 mm. long, glandular-pilose, purple-margined, with 2 conspicuous orange apical calli. *Corolla* 1.5—1.8 cm. long, pale lilac or white, with a rather short widely funnel-shaped greenish tube : petals cuneate, obliquely truncate, slightly attenuate towards the base, often with a purple margin below. *Filaments* the shorter 2.5—3.5 mm., the longer 4—7 mm. long, usually with a few simple hairs, edentate or very shortly toothed. *Ovary* with simple hairs on the upper part, the chambers 2-ovuled. Capsule not exserted. Seeds endospermous. (Plate II (ii)).

CAPE DIV. ; *Schltr.* 7822, *S.* 5270, 7187 : MALMESB. DIV. ; *B.H.* 14566, *Bachmann* 1010 or 1810, *S.* 2259, 2262, 6593, 7359, 8749 : PAARL DIV. ; Drakenstein, *Drège*, *S.* 3374 : Wellington Div. ; *S.* 4497, 6021 : TULBAGH DIV. ; Postelynsberg, *Drège* (*O. phellandrioides* E.Mey. ex Meisn.) : PIQBG. DIV. ; *S.* 5286. Fl. Apl.—June.

For the confusion of this species with *O. livida* Jacq. see Journ. of S.A. Botany VI (1940) 14.

✓ 12. *O. livida* Jacq. Oxal. (1794) 39, t. 8. Caulescent, up to 20 cm. high. *Bulb* broadly ovoid, 1.5—2.5 cm. long, with a vertically acting contractile root : tunics brown, longitudinally ridged, pilose with golden-brown hairs at the apex. *Rhizome without* underground runners. *Stem* often branched, with a few acutely tipped scales. *Leaves* almost glabrous, mostly terminally clustered or more rarely cauline : petioles 1.5—3 cm. long : leaflets 3, shortly petiolulate, triangular in outline, 0.4—1 cm. long, livid purple below, usually deeply bilobed, the lobes linear, obtuse.

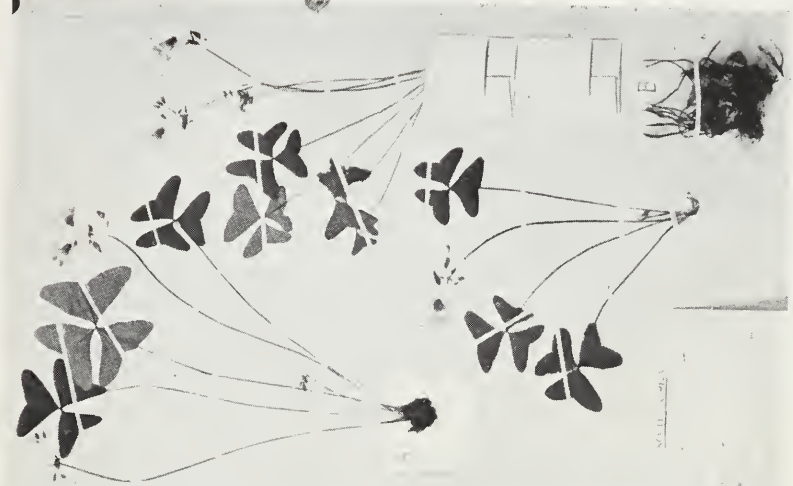


PLATE III.

- (i) *O. livida* Jacq. Showing the flowering stage, the bushy growth after flowering and a contractile root much shrivelled in drying.
- (ii) *O. latifolia* H. B. & K. A. Flowering plant.  
 B. An old bulb with a mass of bulbils.  
 [Photo : R. S. Adamson.]





*Peduncles* 3—6-fld., cauline or terminal, often 7—15 cm. long, usually glandular-pilose on the upper part: bracts lanceolate, acuminate, callus-tipped: pedicels glandular-pilose, usually 1—2 cm. long. *Sepals* lanceolate, acute or obtuse, 4·5—6 mm. long, glandular, purple-margined, with 2 orange apical calli. *Corolla* 1·3—1·7 cm. long, rose, with a short widely funnel-shaped greenish-yellow tube: petals cuneate, obliquely truncate, slightly attenuate towards the base, sometimes with a narrow purple margin beneath. *Filaments*, the shorter 2·5—4 mm., the longer 3·5—6·5 mm. long, pubescent, shortly toothed. *Ovary* pubescent towards the apex, the chambers 2-ovuled: styles pubescent, sometimes glandular-pilose above. Capsule not exerted. Seeds endospermous. (Plate III (i)).

CALEDON DIV.; *Bolus* (B.H. 21930), *Purcell* (S.A.M. 45924): BREDASDORP DIV.; *B.H.* 20434, 20438: WORCES. DIV.; *B.H.* 14504, S. 5258: TULBAGH DIV.; *S.* 5264: STELLENBOSCH DIV.; *S.* 8377: CAPE DIV.; *S.* 8748. Fl. Apl.—May.

This species is very similar in appearance to *O. lateriflora* Jacq., but differs in the root-system. It has hitherto been confused with *O. dentata* Jacq. and all previous descriptions (except that of Jacquin himself) apply to that plant. (See Journ. of S.A. Botany VI (1940) 13—15).

Var. *β altior* Salter, Journ. of S.A. Bot. VI (1940) 8.—*O. liniflora* E. & Z.—*O. lateriflora* Jacq., var. *liniflora* (E. & Z.) Sond. Taller and larger in all parts, often 30—50 cm. high. *Bulb* 1·5—3 cm. long, with a very large vertical contractile root up to 3 cm. in diam. *Leaflets* 1—1·4 cm. long, 1—1·8 cm. broad, very deeply bilobed, the lobes narrower. *Peduncles* 2—4, cauline, or rarely one terminal. *Sepals* 5—7 cm. long. *Corolla* larger, 1·6—2 cm. long, the lamina of the petal pale violet, conspicuously purple-margined below. (Plate. IV.)

CLANWM. DIV.; Brackfontein, *E. & Z.* 662 (*type*); near Olifant's River, *E. & Z.* 663 (*O. liniflora* E. & Z.); Modderfontein, *Schltr.* 7964; Warm Baths, *Edwards* 106, *B.H.* 14598; Grey's Pass, *B.H.* 19677, 19770, *S.* 383/4, 6, 752, 5296, 7350, *Pillans* 6645, Doorn Bridge, *S.* 734. Fl. May—June.

A very slender form with pink flowers and very deeply incised linear-lobed leaflets occurs on the south slopes of Pakhuis Pass, Clanwilliam (*S.* 2135, 8140), which may belong here, but unfortunately the bulb and root system are unknown.

A shade-loving plant. It has hitherto been confused with *O. lateriflora* Jacq., which has no contractile root, but produces lateral underground runners. (See Journ. of S.A. Bot. VI (1940) 14). The varietal characters were retained when grown side by side with the typical form in cultivation.

## SUB-SECT. (iii) PURPURATAE.

Stemless: bulb without an apical beak; tunics smooth, entirely glabrous: peduncles basal. (Sp. 13—15).

- X 13. *O. purpurata* Jacq., Hort. Schoenbr. III (1798) 57, t. 356. Stemless. *Bulb* ovoid, 1—1.5 cm. long, without a contractile root: tunics smooth, chestnut brown. *Rhizome* producing fleshy underground runners which sometimes emerge and produce leaves, or more commonly apical bulbils. Leaves basal, usually 3—5, with hirsute or pubescent petioles: leaflets very broadly cuneate-obcordate, somewhat truncate at the apex, emarginate, tapering cuneately or attenuately to the base, 1—1.5 cm. long, 1.3—2.3 cm. broad, thickish, glabrous and dark green above, pilose and densely purple below, rather closely ciliate. *Peduncle* 2—7-fld., 10—19 cm. long, like the pedicels sparsely pubescent: pedicels usually about 1 cm. long. *Sepals* lanceolate, acute, pubescent, 4—5 mm. long, without apical calli. *Corolla* glabrous, 1.3—1.9 cm. long, pale rosy-lilac, with a rather broadly funnel-shaped yellowish tube: petals cuneate, 4—6 mm. broad. *Filaments*, the longest 6 mm. long, sparsely glandular-pilose, with short obtuse or truncate teeth. *Ovary* pubescent on the upper half, the chamber 7-ovuled: styles pubescent, sometimes with short glandular hairs admixed. Seeds not seen. (Described from cultivated specimens, all of the medio-stylar form.). (Plate V (i).)

V.R's.DORP Div.; Van Rhyn's Pass in rock crevices, *S. 702*. Fl. at Nat. Bot. Gar., Kirstenbosch, May—June.

*O. purpurata* Jacq. is figured in Hort Schoenbr. with underground runners and *Salter 702*, which agrees exactly, appears to be the only collecting since Jacquin's time. It is certain that none of the specimens hitherto cited by previous authors under this name is Jacquin's species. Those which I have seen are comprised under *O. anthelmintica* A. Rich Tent. Fl. Abyss., *O. semiloba* Sond., *O. Bowiei* Lindl., *O. stenorrhyncha* Salter and *O. purpurascens* Salter. A fuller explanation of this confusion is given in Journ. of S.A. Bot., VI (1940) 15.

*O. dentata* Jacq., cited in Pflrch-Oxal. is an entirely different species in the sub-sect. Lividae.

14. *O. Bowiei* Lindl. Bot. Reg. XIX (1833) t. 1585.—*O. Bowieana* Lodd.—*O. purpurata* Jacq., var. *Bowiei* (Lindl.) Sond.—*O. vigilans* L. Bolus. Stemless. Plant more or less pubescent or villose, sometimes with short capitate hairs admixed. *Bulb* ovoid, attenuate, or lanceolate in outline, up to 4.5 cm. long, producing a contractile root: tunics smooth, brown. Leaves basal, petiolate: leaflets suborbicular or very

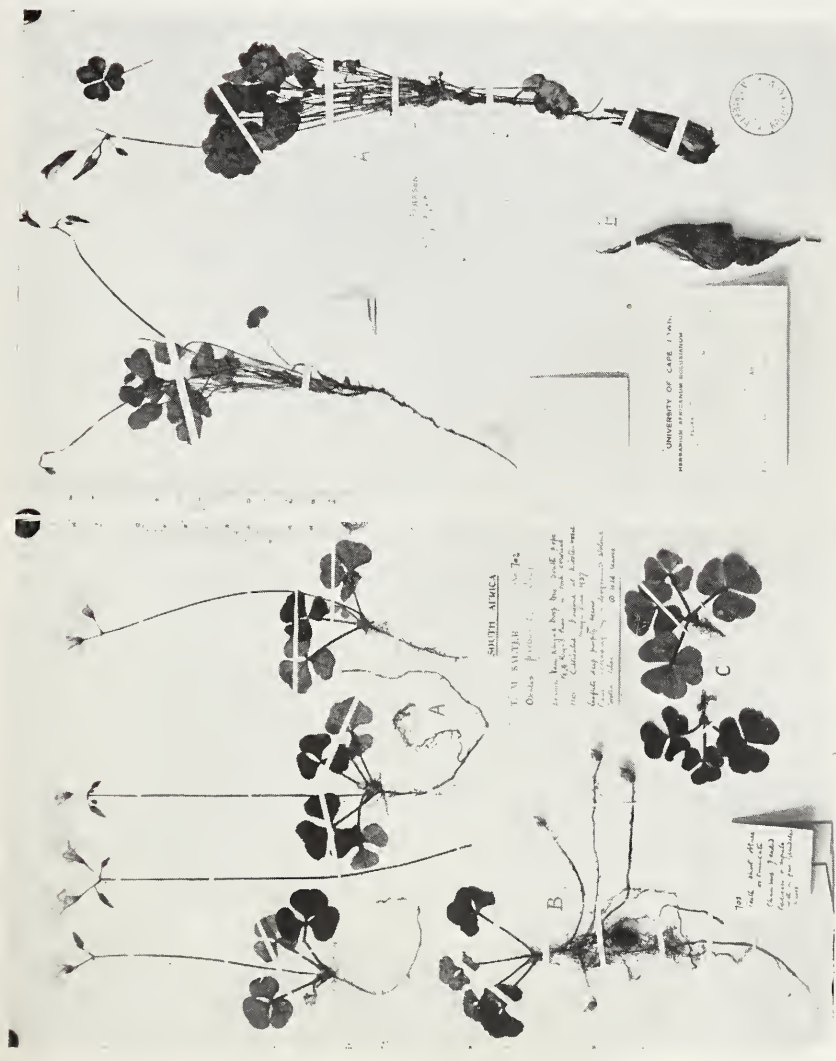


PLATE V.

- (i) *O. purpurata* Jacq. (Cult.). A. A "runner" containing to make leaf. B. Runners producing bulbils. C. Leaves of the wild plant.
- (ii) *O. purpurascens* Salter. A. *Purson* (Percy Sladen Memorial Expedition, 9600 : type). B. Bulb of [Photo : R. S. Adamson, Range 355.





broadly obovate, tapering cuneately to the base, lightly incised or sometimes almost entire, 1—5 cm. long, 1·2—5 cm. broad, rather leathery, glabrous or sparsely pilose above, more densely so and sometimes purple below, ciliate. *Peduncle* 3—12-fld., 10—25 cm. long, usually at least twice as long as the leaves: bracts linear, 7—9 mm. long, ecallose: pedicels usually 1—3 cm. long. *Sepals* lanceolate or linear-lanceolate, 0·6—1·1 cm. long, ecallose. *Corolla* pink, up to 2·5 cm. long, with a short widely funnel-shaped greenish-yellow tube: petals obliquely cuneate, attenuate at the base, rounded at the apex, up to 1·2 cm. broad. *Filaments* the longest 8—9 mm. long, pubescent, sometimes with glandular hairs on the upper part, edentate. *Ovary* more or less pubescent on the upper part, the chambers 5-ovuled: styles pubescent below, glandular-pilose above. Seeds with thin endosperm, the embryo green.

GRAAF REINET; *Bolus* 774, *Galpin* 9967: Uitenhage; Adow, *Zey.* 651: PORT ELIZABETH; *B.H.* 19786: SOMERSET E.; *MacO.* 574: ALBANY; *Zey.* 2125: GRAHAMSTOWN; *Schltr.* 2630, *Glass* 704, *B.H.* 18920, *Leipoldt* (B.H. 18913, *O. vigilans* L. Bolus, River Zonder Einde?): ALICE; *Pappe* (S.A.M. 14525): QUEENSTOWN; *Galpin* 8298: EAST LONDON; *Galpin* 5769: KING W's TOWN; *S.* 3339, 4370: GRIQUALAND E.; Kokstad, *Tyson* 1243: Kamas? *S.A.M.* 14556. Fl. Mch.—May.

This species has been cultivated as a border flower in England. It is quite distinct from *O. purpurata* Jacq., which has an entirely different root-system. See Journ. of S.A. Bot. VI (1940) 15.

15. *O. semiloba* Sond. Flor. Cap. I (1860) 350. (*Group Species*.) This species is only known to me from dried specimens. It appears to differ from the foregoing (*O. Bowiei* Lind.) in usually, but not always having smaller leaves, more deeply bilobed leaflets, rusty apical calli on the sepals, seeds with thick endosperm and in sometimes producing an exerted stem. The name seems to cover a polymorphic group of plants which may possibly be divisible by the characters of the root-system, but the bulbs are almost invariably missing in herbarium specimens. If it is possible to classify the group, it can only be done after special study in the field. It is widespread in the Eastern districts and extends to the northward into Rhodesia and Tanganyika and also occurs at Lourenço Marques. It is possible that the species *O. angustiloba* R. E. Fries from Rhodesia and *O. uhuhensis* Engler from Tropical Africa, both with very deeply lobed leaflets, merge into this group. In many South African herbaria it has been confused with *O. latifolia* H.B. & K., an introduction from Mexico.

TAMBUKILAND; *E. & Z.* 652 (*purpurata*): ALICE; *Barker* (S. 5248, B.H. 20008): KING W's TOWN; *S.A.M.* 49572, *Grant* 2785: TEMBULAND; *Bolus* 8820: TRANSKEI; Komgna, *Flanagan*, 1281,

1695, Kentani, *Pegler* 220: GRIQUALAND E.; Tzitza Riv., *Schltr.* 6362, *Tyson* 1243, 2147: NATAL; *B.H.* 20032, 20086, *Wood* 550 (double flowers): ZULULAND; *Mogg* 4414 ex pte.: BASUTOLAND; Leribe, *Dieterlen* 6787: O.F.STATE; Caledon River, *Burke & Zey.* 440, 271 (type of *O. semiloba*): GRIQUALAND W.; *B.H.* 15023, 15024: TRANSVAAL; *Rogers* 18090: BECHUANALAND; *Harber* (Herb. *Rogers*): SOUTHERN RHODESIA; *Eyles* 4421, *Teague* 340, 476, *Rogers* 5773, 13675: LOURENÇO MARQUES; *Weintraub* (B.H. 21160), *Howard* 76. Fl. Dec.—Apl.

The type is a form with smallish leaflets.

In the absence of the bulbs, some forms are very difficult to distinguish from *O. tragopoda* Salter (Sp. 24).

See *Journal of S.A. Bot.* VI (1940) 16.

#### SUB-SECT. (iv) COSTATAE.

Bulb with an apical beak; outer tunics conspicuously longitudinally ridged. (Sp. 16—17).

16. *O. purpurascens* Salter, *Journ. of S.A. Bot.* VI (1940) 6 and 16. Glabrescent, up to 20 cm. high, stemless or rarely with an exerted stem. *Bulb* narrow-ovoid, acutely beaked, 5—7 cm. long, with a contractile root: tunics hard, lanceolate, acuminate, chestnut-brown, with prominent longitudinal ridges. *Leaves* up to 20, basal, or rarely apically congested with 1—2 cauline: petioles up to 10 cm. long: leaflets very broadly obcordate, broadly incised, sometimes cuneate at the base, 0·8—1·4 cm. long, 1·2—1·7 cm. broad. *Peduncles* 3—5 -fid., 8—17 cm. long: pedicels 1—2 cm. long, like the sepals very sparsely pilose. *Sepals* broadly lanceolate, 5—6 mm. long, with orange apical calli. *Corolla* glabrous, scarcely 2 cm. long, rosy purple (when dry), with a yellow tube. *Filaments*, the longest 4·5 mm. long, pubescent, edentate. *Ovary* glabrous, the chambers about 5-ovuled: styles pubescent. Seeds endospermous. (Plate V (ii).)

S.W. AFRICA: Windhoek region, between Hani and Awas Mts., *Pearson* (P. Sl. Mem. Ex. 9600—type in Bol. Herb.); Awas Mts., *Pearson* 9613, *Dinter* 4656; Hani, *Pearson* 9561; Schakalskuppe, *Pearson* 4223; Kuibis, *Range* 355; Grootfontein, *Schoenfelder* 490. Fl. Jan.—Feb.

This is one of the several species which have been confused in Pflrch-Oxal. with *O. purpurata* Jacq. It is only known to me from the dried specimens cited above.

17. *O. pseudo-cernua* R. Knuth, *Eng. Bot. Jahrb.* LXI, Beibl. n. 139 (1927) 2. Stemless or with a short stem up to 1 cm. long, more or

less pilose. *Bulb* elongate : tunics brown, conspicuously longitudinally ridged. *Rhizome* often about 10 cm. long, sometimes by the action of the contractile root, partly enclosed by old imbricating bulb-tunics. *Leaves* rather numerous, with unequal petioles up to 7 cm. long : leaflets broadly or very broadly cuneate-obcordate, 0·5—1 cm. long, 0·7—1·2 cm. broad, glabrous above, thinly pubescent below, ciliate. *Peduncles* 3—5-fl., up to 10 cm. long, as long or twice as long as the leaves : bracts linear, minutely callose at the apex, pedicels usually 1—1·5 cm. long. *Sepals* more or less lanceolate, about 5 mm. long, acute or obtuse, with 2 small reddish-orange apical calli. *Corolla* 1—1·5 cm. long, white, with a widely funnel-shaped yellow tube : petals cuneate, obliquely subtruncate at the apex, sometimes faintly violaceous on the outer margin beneath. *Filaments*, the longer 4—5·5 mm. long, pubescent, shortly toothed. *Ovary* pubescent on the upper part : styles pubescent. Seeds endospermous.

S.W. AFRICA : Schakalskuppe ; *Range* 1716 (*type*—Berlin) ; Zwart-aus ; *Dinter* 6231 (*O. albella* M.S.) ; Aus, *Dinter* 3568 ; near Chamgab, *Pillans* 6525b (?) cult. Fl. Mch.—June.

The corolla is white, not pale yellow as originally described.

#### SUB-SECT. (v) GOETZEA.

Leaflets entire : flowers reddish.

✓18. **O. Davyana** R. Knuth, Eng. Bot. Jahrb. LXI, Beibl. n. 139 (1927) 4.—*O. Galpinii* Burt Davy. Somewhat robust, softly pilose, stemless or with a short stem. *Bulb* unknown. *Leaves* few : petioles 6—12 cm. long, scarcely widened below the basal articulation : leaflets 3, with very short pilose petiolules, broadly ovate, obovate or subrhomboid, 2—4 cm. long, 2—3 cm. broad, sparsely ciliate, glabrous, (when dried) dark above, paler beneath. *Peduncles* as long as or longer than the leaves : bracts subulate, callus-tipped : pedicels rather numerous, unequal, up to 2 cm. long. *Sepals* oblong-lanceolate, up to 8 mm. long, with several elongate rusty apical calli. *Corolla* up to 2 cm. long, deep pink. *Filaments*, the longest 7—7·5 mm. long, with glandular and simple hairs admixed, toothed. *Styles* densely pubescent.

TRANSVAAL : Barberton district, Umlomati valley, 4000 ft., *Galpin* 1010b (*type* in Kew Herb.) ; SWAZILAND : Havelock Concession, *E. Saltmarsh* (*Galpin* 1010—*S.A.M.* 30499).

Only known to me in the dried state.

## SUB-SECT. (vi) STELLATAE.

Bulb with an apical beak, the outer tunics smooth. (Sp. 19—25).

19. *O. stenorrhyncha* Salter, Journ. of S.A. Bot. VI (1940) 8 and 16. Caulescent, almost glabrous, up to 25 cm. high. *Bulb* ovoid with a narrow apical beak longer than the bulb, in all 5—7 cm. long: outer tunics papery, ash-coloured, attenuate and twisted at the apex. *Stem* stout, up to 14 cm. long, 2 mm. in diam., sometimes branching. *Leaves* numerous, apically congested on the stem and branches: petioles 2—4 cm. long, scale-like below the basal articulation: leaflets 3, with short sparsely villose petiolules, triangular in outline, bilobed to the middle or beyond, 1—1.4 cm. long, 1—2 cm. broad, the oblong obtuse lobes 3—4 mm. broad, or rarely broader. *Peduncles* 3—7-fld., about twice as long as the leaves: bracts linear, callose at the apex: pedicels 1—2 cm. long. *Sepals* oblong-lanceolate, 5—6 mm. long, with 2 elongate orange apical calli. *Corolla* 1—1.3 cm. long, brick-red or salmon, with a broadly funnel-shaped yellow tube: petals cuneate, 5—6 mm. broad. *Filaments*, the longer 3.5—5 mm. long, glandular-pilose, gibbose or shortly toothed. *Ovary* glabrous, the chambers 2—3-ovuled: styles with pluricellular hairs. Capsule subglobose. Seeds endospermous. (Plate VI (i).)

KING W's TOWN; Line Drift near Keiskama River, *Leighton* (*S. 2290*, type in Bol. Herb.) 4371; GRAHAMSTOWN, *Dyer* 1383, *Britten* 2781; KOMGHA, *Flanagan* 2329; PORT ALFRED, *Tyson* (Pretoria Herb. 12583), *Britten* 2128, *White* 56, 84, *Rogers*, *Salisbury*, *Henry*; EAST LONDON, *S. 379/46*, *Galpin* 5663, *Wood* (Galpin 3243). The last is erroneously cited in Pfeich-Oxal. under *O. purpurata* Jacq., var.  $\beta$  *Jacquinii*. Fl. Jan.—June.

An affinity of the following species. It is confused with *O. semiloba* Sond. in many herbaria, but it has an entirely different bulb and much smaller brick-red flowers.

20. *O. stellata* E. & Z., Enum. I (1836) 84 (661).—*O. polyscapa* E. & Z.—*O. stellata* E. & Z., var. *violacea* Sond. Caulescent, glabrous, up to 30 cm. high. *Bulb* ovoid, up to 3 cm. long, produced into a beak at the apex: tunics smooth, dark brown. *Rhizome* long. *Stem* up to 9 cm. long, rarely branched. *Leaves* few or many, apically congested: petioles slender, up to 12 cm. long, often 3—5 cm. long: leaflets 3, triangular in outline, broadly cuneate at the base, widely bilobed nearly to the base, the lobes 1—1.5 cm. long, 1—2 mm. broad, tapering slightly towards the apex. *Peduncles* usually 3—6-fld., apical, as long or twice as long as the leaves: bracts linear or linear-lanceolate, up to 8 mm. long, ecallose: pedicels slender, 2—4 cm. long. *Sepals* lanceolate or





PLATE VI.

[Photo: R. S. Adamson.



oblong-lanceolate, acute, 5—8 mm. long, with 2 elongate rusty apical calli. *Corolla* up to 2 cm. long, rosy or white, with a yellow tube. *Filaments*, the shorter 2—4 mm., the longer 4—6.5 mm. long, sparsely pilose, minutely toothed. *Ovary* shortly stipitate, the chambers several-ovuled : styles pubescent. *Capsule* elongating beyond the calyx. Seeds endospermous.

UITENHAGE DIV. ; Zwartkoprivier, *E. & Z.* 661 (*type*), *Zey.* 2137, (*O. stellata* *E. & Z.*), 2135, 2138, *Bolus* 1956, *Schltr.* 2546, *S.* 380/92, *Paterson* 542, *B.H.* 19796 : ALBANY DIV. ; *E. & Z.* 660 (*O. polyscapa* *E. & Z.*) : CRADOCK DIV. ; *Kensit* (*B.H.* 22302). GEORGE DIV. ; *Pillans* 6656 : SWELLENDAM DIV. ; *B.H.* 21929 : CALEDON DIV. ; *S.* 3331, 7219. *Fl. Apl.*—June.

× Var. *β glandulosa* Salter, *Journ. of S.A. Bot.* V (1939) 69. A more slender, laxer shade-loving plant. *Bulb* smaller, about 1.5 cm. long, shortly beaked. *Stem* exserted, sometimes branched. *Leaflets* bilobed to the middle or a little beyond, with obtuse lobes. *Peduncles* 2—3-fld., terminal or sometimes one cauline, like the pedicels and sepals glandular-pilose, especially on the upper part. *Corolla* smaller, 1.1—1.3 cm. long, white or pale violet, with a dull green tube : petals narrower, spatulate-cuneate. *Ovary* about 8-ovuled. *Capsule* exserted.

CALEDON DIV. ; about 11 miles west of Caledon, *S.* 2397 (*type* in *Bol. Herb.*), 3310, 3312, 7214. CERES DIV. ; Michell's Pass, *S.* 2099 : SWELLENDAM DIV. ; near Barrydale, *S.* 2330 : CAPE PENIN. *Pillans* 8882, *S.* 8078. *Fl. Apl.*—June.

× Var. *γ montaguensis* Salter, *Journ. of S.A. Bot.* VI (1940) 9. Almost glabrous, rather compact. *Stem* 3—4 cm. long, rarely branched, often producing aerial bulbils in the leaf axils after the flowering period. *Leaves* 10—15 : petioles 2—4 cm. long : leaflets widely bilobed, divided to the middle or rather deeper, the lobes oblong-obovate or oblong, obtuse. *Peduncles* 4—5-fld. ; pedicels 1.5—2.3 cm. long. *Corolla* 1.5—1.8 cm. long, pale violaceous, with a greenish-yellow tube. *Ovary* glabrous, the chambers 4-ovuled. (Plate VI (ii).)

MONTAGU DIV. ; Cogman's Kloof, *S.* 2315 (*type* in *Bol. Herb.*) *Fl.* (in cult.) *Apl.*—May.

The lobes of the leaflets are shorter and broader and do not taper towards the apex as in the typical form. The production of aerial bulbils has not been observed in any other form of this species.

✓ Var. *δ gracilior* Salter, loc. cit. 10. Very slender, almost entirely glabrous, up to 15 cm. high. *Bulb* shortly beaked. *Stem* 1—4 cm. long. *Leaves* 4—12, usually apical : petioles filiform, 2—4 cm. long : leaflets triangular in outline, 2/3 to 3/4 bilobed, the greatest breadth 6—8 mm. *Peduncles* 6—8 cm. long, cauline or apical, 2—4-fld. : pedicels

1.5—2 cm. long. *Sepals* 3—3.5 cm. long, bicallose. *Corolla* rosy, 1.1—1.3 cm. long, with a yellowish tube. *Ovary* chambers 2—3-ovuled.

GEORGE DIV.; near George, *S.* 3175 (*type* in Bol. Herb.) Fl. Apl.

Smaller and more slender than the typical form and having much smaller flowers. The leaflets are thinner and the lobes less widely divergent than in other forms and widen slightly towards the apex.

✓ 21. *O. Lindaviana* Schlechter, Eng. Bot. Jahrb. XXVII (1900) 154. Slender, almost glabrous, up to 24 cm. high, with an exserted sparsely scaly stem 2—13 cm. long. *Leaves* fairly numerous, apically clustered: petioles usually 3—6 cm. long: leaflets broadly triangular in outline, bilobed to about the middle, more or less cuneate at the base, 5—7 mm. long, 0.9—1 cm. broad, the lobes very obtuse. *Peduncles* 3—6 fld., apical or rarely cauline, slender, 8—11 cm. long: bracts subulate, 3—5 mm. long: pedicels 2—4, filiform, 2—5 cm. long. *Sepals* lanceolate, sharply acute, 4—5 mm. long, ecallose. *Corolla* up to 1.7 cm. long, pale violaceous.

CLANWM.—PIQBG. BORDER; Piquenier's Kloof (Grey's Pass), *Schltr.* 7940 (*type*). Fl. June.

Only known to me from a few imperfect specimens without bulbs and I have not succeeded in finding it after repeated searches in the locality given.

The following is a more full description of a very similar plant, but from quite a different locality and having most distinctive bulbils with long ridged beaks. As far as can be seen, it appears only to differ essentially in that the stem is not always exserted, probably only an epharmonic difference. Since I am not certain that it is the same as Schlechter's species, I hesitate to amplify the above description or to describe it as new. Should *O. Lindaviana* be re-discovered in the type locality, a comparison of the bulbils would at once show whether it is the same.

Slender, lax, stemless or more rarely with a well exserted stem, almost glabrous. *Bulb*, when mature, deep, ovoid, with a short acute apical beak: tunics light brown: bulbils oblong, sub-cylindrical or sub-obconic, 7—8 mm. long, usually convex at the apex, with a long slender tapering sharply longitudinally-ridged beak, 2—3 times as long as the bulbil. *Rhizome* long, very slender. *Stem*, if exserted, slender, naked, up to 10 cm. long. *Leaves* up to 20: petioles filiform, 3—6 cm. long, sometimes sparsely villous towards the base: leaflets 3, triangular in outline, up to 9 mm. long and broad, ecallose, obtusely bilobed to about the middle, the medial symmetrical, the anterior lobes of the 2 lateral much longer than the posterior. *Peduncles* 2 to 3 times as long as the leaves, almost filiform: pedicels usually 3 to 4, 2—3 cm.



long, minutely glandular-pilose. *Sepals* lanceolate, 3—3.5 mm. long, glabrous, ecallose. *Corolla* pale mauve, 1.2—1.6 cm. long, with a greenish funnel-shaped tube: petals oblanceolate, 2—3 mm. broad. *Filaments* glabrous, the shorter 2—4 mm., the longer 4—5 mm. long, very unequal, edentate. *Ovary* oblong, almost glabrous, the chambers 5-ovuled: styles pubescent. *Capsule* about 7 mm. long, exerted beyond the calyx. Seeds endospermous.

WORCES. DIV.; Little Doorn River Valley, S.S.E. of Brand Vlei, in shale under bushes, *Leipoldt* (B.H. 22447). Fl. June.

22. *O. dichotoma* Salter, Journ. of S.A. Bot. VI (1940) 3. Slender, stemless, almost glabrous, up to 15 cm. high. *Bulb* globose, beaked at the apex, about 2 cm. long, with smooth dark brown tunics. *Leaves* about 5, with petioles 4—8 cm. long: leaflets 3, very shortly petiolulate, sparsely villous, triangular in outline, 1—3 cm. long, 1.4—3.3 cm. broad, narrowed cuneately to the base, bilobed nearly to the base, the lobes oblong, obtuse. *Peduncles* 2—9 fld., twice as long as the leaves: bracts subulate, about 4 mm. long, ecallose: pedicels glabrous, 1—2.5 cm. long. *Sepals* narrow-lanceolate, acuminate, 6—7 mm. long, glabrous, with 2 elongate orange apical calli. *Corolla* 1.5—2 cm. long, violaceous, with a funnel-shaped yellowish tube: petals cuneate, 5—7 mm. broad, truncate at the apex. *Filaments*, the shorter 2.5—4.5 mm., the longer 4—7.5 mm. long, sparsely glandular-pilose, gibbose. *Ovary* sparsely pubescent above, the chambers many-ovuled: styles pubescent. *Capsule* exerted. Seeds with thin endosperm, the embryo green. (Fig. 6.)

OUTDSHOORN DIV.; between Gamka River Causeway and Calitzdorp, in partial shade. *S. 6720* (type in Bol. Herb.), *Lewis* (S.A.M. 54367). Fl. Mch.

23. *O. caprina* L. Syst. (1774) 433.—*O. erecta* Savign. Rather weak, usually 15—20 cm. high, almost glabrous or very sparsely pubescent, stemless or rarely with a very short stem. *Bulb* ovoid, about 1.5 cm. long, more or less beaked at the apex, with brown outer tunics. *Rhizome* slender with a few small amplexicaul scales. *Leaves* 2—20, basal or apically congested on a very short stem, more or less erect: petioles usually 2—5 cm. long: leaflets 3, with very short villosopubescent petiolules, widely triangular, bilobed to about the middle or less, sometimes sparsely pilose below, 0.5—1 cm. long, 0.5—1.5 cm. broad, the lobes more or less obliquely obovate, obtuse, the sinus broad or narrow. *Peduncles* 2—4 fld., basal or very rarely lateral on a short stem, often twice as long as the leaves: bracts subulate, callose at the apex: pedicels 2—5 cm. long, like the sepals, glabrous, sparsely pubescent or rarely glandular-pilose. *Sepals* broadly lanceolate, 4—5 mm. long, with 2 small orange apical calli. *Corolla* glabrous, 1.3—1.9 cm. long, pale violet

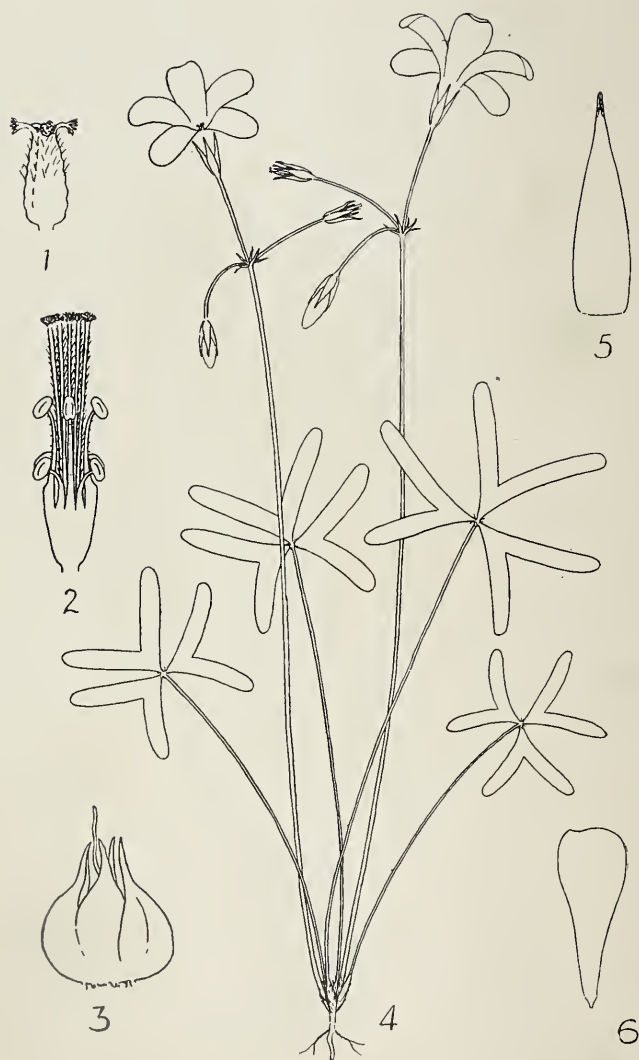


FIG. 6. *Oxalis dichotoma* Salter. 1. Gynaecium  $\times 6$ . 2. Androecium  $\times 6$ . 3. Bulb, natural size. 4. Plant, natural size. 5. Sepal  $\times 5$ . 6. Petal  $\times 1\frac{1}{2}$ . (Salter 6720.)

or rarely white, with a widely funnel-shaped pale greenish tube: petals cuneate, rounded at the apex, 5—7 mm. broad. *Filaments*, the shorter 1·5—3·5 mm., usually glabrous, the longer 3·5—5·5 mm. long, minutely glandular-pilose, edentate. *Ovary* pilose on the upper half, the chambers 8—9-ovuled: styles pubescent. *Capsule* elongate, exserted. Seeds endospermous.

CAPE PENIN.; *E. & Z.* 655 (*O. dentata*) ex pte., *Bolus* 7986, *W.-Dod* 2450, *B.H.* 14508, *S.* 245/22, 513, 3044, 8072, 8093: CAPE DIV.; *S.* 523: CALEDON DIV.; *B.H.* 22303, *Schltr.* 10389, *Guthrie* 2232, *L. Bolus* (B.H. 20112, white): RIVERSDALE DIV.; *S.* 2366: M. BAY DIV.; *S.* 2343: OUDTSHOORN DIV.; *S.* 3131, *Compton* 10743: UNIONDALE DIV.; *S.* 3203, 3232: ALEXANDRIA DIV.; *B.H.* 19783: Uitenhage DIV.: *E. & Z.* 656 (*O. macrophylla* Hornem.) *Zey.* 2105, *Paterson* 611, 2708. Fl. Apl.—June.

*O. biflora* Burm. f. (*Burm. Afr. Pl. Rar.* (1738) 73, t.28) may be this species, but the figure is not typical of it.

*Schltr.* 10389, Onrust, cited in *Pfirsch-Ox.* as *O. caprina* is *O. dentata* Jacq.

Though apparently native in the Cape Peninsula, it occurs most frequently as a weed of cultivation and only the short-styled form has been found. (See Introduction, Part VII, *Heterostyly* (iii).)

24. *O. tragopoda* Salter sp. nov. Acaulis. *Bulbus* ovoideus, breviter rostratus, ad 2·5 cm. longus, tunicis rigidis, pallidissime brunneis, conspicue costatis. *Foliola* 3, late obcordata, fere  $\frac{1}{4}$ -incisa, 1—1·4 cm. longa, 1·2—1·8 cm. lata. *Pedunculi* 12—18 cm. longi, pedicellis 3—7, glanduloso-pilosis. *Sepala* lineari-lanceolata, glanduloso-pilosa, callis apicalibus ferrugineis, fere 1 mm. longis. *Corolla* 1·5—1·7 cm. longa, pallide violacea: petala anguste cuneata. *Ovarii* loculae 2—4-ovulatae. *Capsula* vix exserta.

Stemless, 15—20 cm. high. *Bulb* ovoid, shortly beaked, up to 2·5 cm. long, the outer tunics hard, very pale brown, with raised longitudinal nerves. *Rhizome* 15—20 cm. long, the bulbils sessile. *Leaves* few or many: petioles 4—10 cm. long, sparsely villous: leaflets 3, with very short villous petioles, very broadly obcordate, about  $\frac{1}{4}$ -incised, thin, 1—1·4 cm. long, 1·2—1·8 cm. broad, almost glabrous, sparsely ciliate. *Peduncles* 12—18 cm. long, very sparsely villous below, glandular-pilose near the apex: bracts linear: pedicels 3—7, up to 2·5 cm. long, glandular-pilose. *Sepals* linear-lanceolate, 5—6 mm. long, glandular-pilose, with 2 rusty linear pustulate apical calli about 1 mm. long. *Corolla* 1·5—1·7 cm. long, pale violaceous, the funnel-shaped greenish-yellow tube often paler in the throat: petals narrow-cuneate, about 4 mm. broad. *Filaments*, the shorter 2—3·5 mm., the longer 3—6·5 mm. long,

pubescent, gibbose, the longest unequal. *Ovary* pubescent on the upper half, the chambers 2—4. (usually 4.) ovuled : styles pubescent. *Capsule* about 6 mm. long, not or scarcely exserted. Seeds with very thin endosperm and a green embryo.

ALEXANDRIA DIV. ; *Galpin* 10802, *Pillans* 8526 : ALICE ; *Zey.* : P. ELIZ. *Bolus* 2664 : KNYSNA DIV. ; *Pillans* 6652, *Duthie* 1219 : GRAHAMSTOWN ; *Leighton* (S. 6010, *type* in Bol. Herb.).

Closely resembling *O. caprina*, L., but more robust. It differs in having a much larger pale bulb with longitudinally ridged tunics, narrower petals and sepals, the latter with much longer apical calli and the capsule, with only 2—4 ovules in each chamber, is not exserted.

I have previously determined this species in some herbaria as *O. caprina* Form B.

✓ 25 *O. anomala* Salter, Journ. of S.A. Bot. II (1936) 53. Stemless, up to 18 cm. high. *Bulb* globose or ovoid, beaked at the apex, 1.5—2.7 cm. long : tunics hard, blackish-brown, longitudinally nerved, often minutely bullate. *Leaves* 10—30 : petioles 2—6 cm. long, slender, sparsely villose : leaflets shortly petiolulate, very broadly obcordate, cuneate-attenuate towards the base, about  $\frac{1}{4}$ -incised at the apex, 3—7 mm. long, 0.5—1.1 cm. broad, glabrous above, livid-purplish beneath. *Peduncles* 1-fl. or 2-fl., much longer than the leaves, very sparsely villose : bracts 2 or 4, subulate, villose, minutely callose at the apex : pedicels 1 or 2, 3—4.5 cm. long, glabrous. *Sepals* lanceolate, 5—7 mm. long, glabrous or sparsely villose, with 2 elongate orange apical calli. *Corolla* 2.1—2.8 cm. long, rosy-violet, with a narrowly funnel-shaped greenish-yellow tube : petals cuneate-oblanate, slightly attenuate towards the base, lightly veined. *Filaments*, the shorter 3—5 mm., the longer 5—8.5 mm. long, sparsely glandular-pilose towards the apex, edentate, the longest unequal. *Ovary* oblong, 2—3 mm. long, shortly stipitate, like the styles, villosa-pubescent, the chambers 6-ovuled. *Capsule* oblong, well exserted. Seeds endospermous. (Fig. 7.)

SWELLENDAM DIV. ; near Warmbad, Barrydale, S. 2334 (*type* in Bol. Herb.), *L. Bolus* (B.H. 20110) : LADISMITH DIV. ; 10 miles southwest of Ladismith, S. 2332. Fl. May—June.

This species is intermediate between the Sections *Cernuae* and *Oppositae*.

#### Sect. D. OPPOSITAE.

Bracts usually opposite, set at an upper or second articulation on the peduncle, which deflexes in the upper part after pollination : stemless or caulescent : leaflets 3, variously shaped : seeds endospermous.



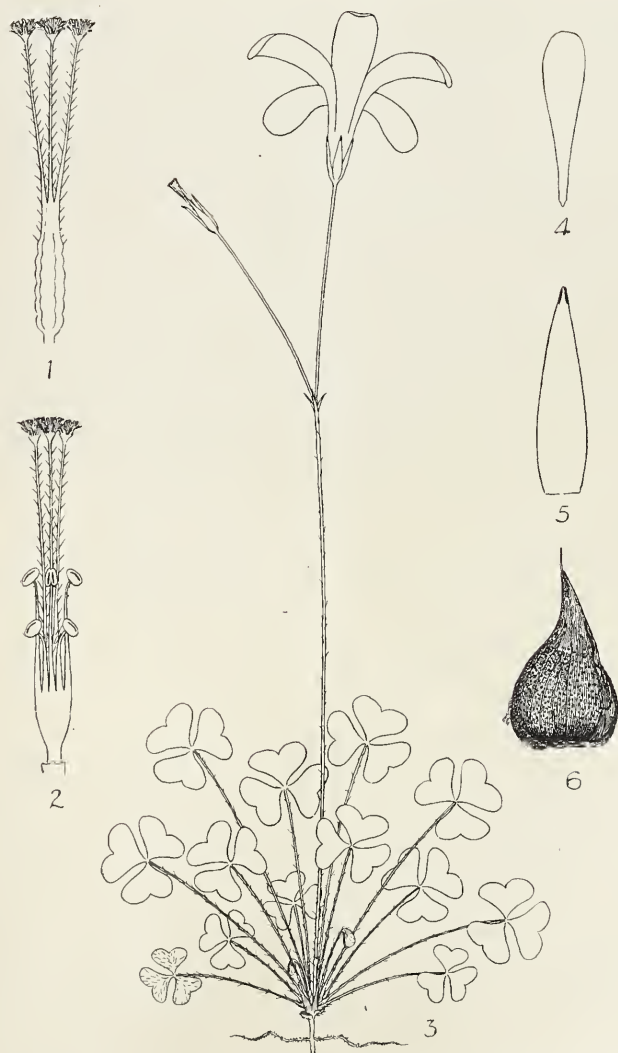


FIG. 7. *Oxalis anomala* Salter. 1. Gynaecium  $\times 6$ . 2. Androecium  $\times 6$ . 3. Plant, natural size. 4. Petal, natural size. 5. Sepal  $\times 5$ . 6. Bulb, natural size. (Salter 2334.)

Exceptions: *O. strigosa* and *O. zeekoevleyensis* have alternate bracts, but the bud is cernuous.

This section consists of plants showing the gradual process of reduction from the umbellate to the unifloral form, the articulation and the arrangements of the bracts representing the rudimentary remains of the umbel. *O. lanata* sometimes but very rarely produces a pair of pedicels, while the bulb in *O. psilopoda* shows that it is closely related to the sub-section Stellatae of the Section Cernuae. (See also *O. anomala* and *O. copiosa* in § Cernuae, which are sometimes unifloral.)

#### SUB-SECT. (i) SUBINTEGRAE.

Leaflets usually subrotund or obcordate, or if oblong, then crenate at the margins, or if linear then pendulous. (Sp. 26—47.)

Though not an entirely natural sub-section, many of the species are closely related to one another and affinities are placed in juxtaposition as far as possible. *O. pendulifolia* and *O. duriuscula* are very closely related to *O. heterophylla* in the Sub-section Bifurcatae. (See Groups 5 and 15 of Analysis of the Species.)

Leaflets usually broad, or if narrow, not pendulous.

Leaves not in whorls.

Peduncle deflexing in the upper part only after pollination:

flower buds cernuous . . . . . Sp. 26—37

Peduncle deflexing both at the lower articulation and also in the upper part

Flower buds cernuous . . . . . Sp. 38

Flower buds erect . . . . . Sp. 39—44

Leaves usually in whorls on the stem . . . . . Sp. 45

Leaflets linear or oblong, pendulous: stem well exserted . . . . . Sp. 46—47

26. *O. psilopoda* Turcz., Bull. Soc. Nat. Mosc. XXXI, I (1858) 434. —*O. uitenhagensis* Sond.—*O. minutifolia* R. Knuth.—*O. sublanata* R. Knuth. Weak, stemless, softly villous, up to 13 cm. high. *Bulb* ovoid-globular, rather small, with a long acute beak about equal in length to the rounded part: tunics hard, greyish-brown, often with longitudinal nerves. *Rhizome* very slender, 1—5 cm. long with a few small scales. *Leaves* few, basal: petioles slender, pale, 1—4 cm. long, villose: leaflets 3, shortly petiolulate, very broadly obcordate, sometimes tapering cuneately at the base, 2—7 mm. long, 3—9 mm. broad, the lateral somewhat oblique, thin, glabrous or rarely villose above, densely silky with long weak hairs and sometimes livid beneath, ecallose. *Peduncles* 1-fl., 10—13 cm. long, weak, villose, sometimes glabrous or glandular-pilose on the upper part, with 2 linear or subulate opposite bracts at an articulation above the middle. *Sepals* lanceolate, about 6 mm. long, villose, usually bicallose at the apex. *Corolla* 1.6—2 cm. long, glabrous, white

or rosy-violet, with a rather widely funnel-shaped yellow tube: laminae of the petals broadly obovate, about as long as the narrow-cuneate claw. *Filaments*, the shorter 2·5—4 mm., the longer 4·5—7 mm. long, unequal, very sparsely glandular-pilose, edentate or rarely very shortly toothed. *Ovary* pubescent on the upper half: styles thickly pubescent below, glandular near the apex. *Capsule* exerted from the calyx, the chambers 5—7-ovuled. Seeds with thin endosperm, the embryo green.

UITENHAGE AND P. ELIZ. DIVS.; *Zey.* 2119 (type in Herb. Sond.), 2112, 1075, *E. & Z.* 4 (Adow), *S.* 380/91B, *Paterson* 2272, 2273, 2707, HUMANSDORP DIV.; *S.* 3204B: KNYSNA DIV.; *Duthie* 1227: *E.* LONDON; *Flanagan* 2328: UNIONDALE DIV.; Kouga River, *Compton* 5241A: M. BAY DIV.; *S.* 2350, 2360: RIVERSDALE DIV.; *Muir* 2639, *Rust* 522 (*O. minutifolia* R. Knuth): GEORGE; *Schltr.* 2386 (*O. sublanata* R. Knuth): ? loc. *B.H.* 21325, 21326. Fl. Mch.—June.

Not easily recognised from some forms of *O. imbricata* E. & Z., except by its long peduncles and very different bulb, very much like that of *O. caprina* L. and *O. anomala* Salter, which are evidently its closest affinities. I cannot separate this variable species from the two synonyms of R. Knuth cited above.

27. *O. imbricata* E. & Z., Enum. I (1836) 93, no 736.—*O. multifolia* Turcz. Stemless or with a very short stem, rather densely villosopubescent. *Bulbs* in elongate clusters, narrow-ovoid or lanceolate, often contorted, the older tunics persisting and imbricating on the rhizome by the action of the contractile root: tunics more or less lanceolate, sharply acute, often undulate, splitting and lacerated towards the base. *Leaves* usually numerous, rosulate or imbricate on a very short stem: petioles up to 5 cm. long, the younger sublanate: leaflets broadly obcordate, 2—9 mm. long and broad, usually punctate with small brown calli, more thinly pilose on the upper than on the under side, sometimes purplish beneath. *Peduncles* 1-fld., usually twice as long as the leaves: bracts 2, subulate, opposite at an articulation on the upper part. *Sepals* lanceolate or broadly lanceolate, 4—5 mm. long, usually with 2 reddish apical calli. *Corolla* 2—2·5 cm. long, white with a greenish tube: laminae of the petals broadly and obliquely obovate, 1·3—1·6 cm. broad, twice as long as the claw. *Filaments* the shorter 1·5—3·5 mm., the longer 4—6 mm. long, glabrous or minutely glandular-pilose, with rather long teeth. *Ovary* densely pubescent on the upper half, the chambers 4—6-ovuled: styles pubescent near the base, minutely glandular above. Seeds with thin endosperm, the embryo green.

UITENHAGE AND P. ELIZ. DIVS.; Quaggasvlagte, *E. & Z.* 736 (type), *Zey.* 2106, 2116, 2120, *Holland* 4125, *Galpin* 6404, 6405, *Long* 1269, *Paterson* 541, 2271: M. BAY DIV.; *S.* 3269. Fl. Apl.—June.

Var.  $\beta$  **violacea** R. Knuth.—*O. elegantula* Turcz.—*O. aganophila* Sond.—*O. georgica* Bolus f.—*O. riversdalensis* R. Knuth.—*O. vestita* R. Knuth. Hairs simple, gland-tipped or pluricellular. *Stem* not or scarcely exserted. *Leaflets* often glabrous above. *Corolla* rose. *Filaments*, the longer with long teeth.

FORM A. *typical of the variety.*

UITENHAGE AND P. ELIZ. DIVS.; Bushman's River, *Zey.* 2126 (type), 2107 ex pte., *E. & Z.* 737 (*O. ciliariflora* E. & Z. ex pte.), *Holland* 3613, *B.H.* 19787, 19785, 19793, 19794; *Paterson* 2081, 6649, 6655, *Pillans* 6649: EAST LONDON; *Flanagan* 2328: GRAAF-REINET; *Bolus* 2: BATHURST DIV.; *Britten* 5357: SOMERSET E. DIV.; *MacOwan* 1694: ALEXANDRIA DIV.; *Galpin* 10803: ALBANY DIV.; *Dyer* 1456, 2392: WILLOWMORE DIV.; Karrega Riv., *Zey.* 2127 (*O. aganophila* Sond.): OUDTSHOORN DIV.; *S.* 2338: M. BAY DIV.; *Pillans* 6655, *Muir* 1377: GEORGE DIV.; *F. Guthrie* 4283 (*O. georgica* Bolus f.), Silver River, *Schltr.* 2383 (*O. vestita* R. Knuth), *S.* 3161, 3162, 3181B: UNIONDALE DIV.; *Fourcade* 4999, *S.* 3204, 3231: KNYSNA DIV.; *Duthie* 802, 1221, *S.* 3196, 6736: HUMANSDORP DIV.; *Fourcade* 1207, *S.* 3216: RIVERSDALE DIV.; *Rust* 515 (*O. riversdalensis* R. Knuth), *S.* 2362: SWELLENDAM DIV.; *Thode* A2304.

FORM B. Plant smaller in all parts, the peduncle many times longer than the leaves.

KING W'S TOWN DIV.; *S.* 4369: GRAHAMSTOWN; *S.* 4378.

This form has retained its characters in cultivation and is probably a small variety.

Var.  $\gamma$  **cuneifolia** Salter, Journ. of S.A. Bot. VII (1941) 159. Caespitose. *Stem* exserted, 2—4 cm. long, densely pilose. Medial leaflet cuneate, up to 1 cm. long, pilose on both faces, conspicuously incised at the apex, the lateral smaller, oblique. *Filaments*, the longer very shortly toothed. *Corolla* tube narrower, with a dark purple eye in the throat: petals cuneate, the lamina rosy-purple. (Fig. 8.)

FORM A. Medial leaflet longer than broad. RIVERSDALE DIV.; near Gouritz River Bridge, *Pillans* 6654 (type in Bol. Herb.) *S.* 2378. Fl. May—June.

FORM B. Medial leaflet cuneate-obcordate, as broad or broader than long. SWELLENDAM DIV.; Moodies Hoogte, *S.* 2387.

An exceedingly variable and wide-spread species and I am unable to find any definite line of separation for any of the synonyms cited. The type of *O. aganophila* Sond. (*Zey.* 2127) is a lanky shade form with the leaves imbricating on a short stem and the glandular or short pluricellular hairs, its chief claim for separation, occur in varying degrees in many forms of var.  $\beta$ . *O. georgica* Bolus f., usually with rather smaller

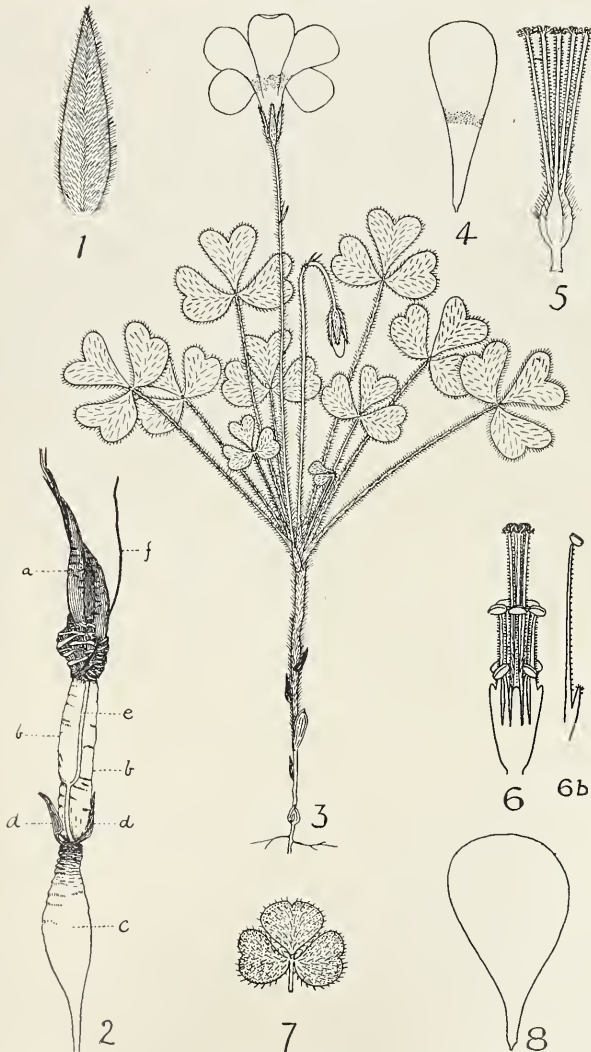


FIG. 8. *O. imbricata* E. & Z., var. *cuneifolia* Salter. 1. Sepal  $\times 5$ . 2. Bulb, natural size: (a) current year's bulb, (b,b) new bulbs forming, (c) contractile root, (d,d) exhausted nutritive scales, (e) intercalary prolongation of the rhizome, (f) ditto, dead and persisting from the previous year. 3. Plant, natural size. 4. Petal  $\times 1\frac{1}{2}$ . 5. Gynoecium  $\times 5$ . 6. Androecium, 6b long filament of typical *O. imbricata*  $\times 5$ . 7. Leaf of *O. imbricata* var. *violacea*, natural size. 8. Petal of same  $\times 1\frac{1}{2}$ . (Pillans 6654.)



flowers and in which the leaflets tend to be more rotund and perhaps less hairy, is again only one of the numerous forms in the group and has no claim to specific or varietal rank.

*Zey.* 2110, which has previously been attributed here, is *O. zeekoevleyensis* R. Knuth. Its confusion with *O. imbricata* and its differences are pointed out in Journ. of S.A. Bot. VII (1941) 161—2.

- \* 28. *O. ioeides* Salter & Exell, Journ. of Bot. LXVIII (1930) 145. Small, stemless. *Bulb* ovoid, acute at the apex, 1·5—2 cm. long: tunics rather thin, brown, splitting at the base. *Rhizome* slender, 2—6 cm. long, minutely glandular-puberulous. *Leaves* few or fairly numerous, rosulate: petioles up to 2 cm. long, rather densely glandular-pubescent: leaflets 3, broadly cuneate-rotund, emarginate, or cuneate-obcordate, lightly incised at the apex, 3—7 mm. long, 4—10 mm. broad, glabrous on both faces, minutely glandular-ciliate, usually reddish-purple beneath, with numerous rather conspicuous reddish-brown calli, particularly near the margins. *Peduncles* 1-fl., 6—12 cm. long, much longer than the leaves, minutely glandular-pubescent, with 2 small linear opposite bracts at an articulation towards the apex. *Sepals* more or less broadly lanceolate, 3—4 mm. long, sparsely glandular. *Corolla* 0·9—1·7 cm. long, glandular, rose-red (often drying bluish-violet), with a rather narrowly funnel-shaped yellow tube: laminae of the petals obliquely cuneate, about as long as the tapering claw. *Filaments*, the longer 2·5—5 mm. long, minutely glandular-pubescent, edentate. *Ovary* glandular on the upper part, the chambers 2—3-ovuled: styles glandular-pubescent. Seeds with thin endosperm, the embryo green.

MOSSEL BAY DIV.; Robinson Pass, S. 383/22 (*type* in Brit. Mus.), 2342, 3262: GEORGE DIV.; Kammanassie, *Esterhuysen* 4729, *Stokoe* 7244. Fl. May—June.

A mountain species, closely related to the foregoing, but smaller and differing in its proportionally longer corolla tube, edentate filaments and more rotund leaflets which are glabrous on both faces. The colour of the corolla was originally described erroneously as bluish-violet from a dried specimen.

- \* 29. *O. calvinensis* R. Knuth, Eng. Bot. Jahrb. LXI, Beibl. n. 139 (1927) 23. Stemless 4—6 cm. high. *Rhizome* pubescent, thickish, glandular-pilose above, over 9 cm. long. *Leaves* 13—30, closely imbricate and sub-basal; petioles 2—3 cm. long, glandular-pilose, dilated below the articulation: leaflets 3, obcordate-obreniform, rather deeply incised, conduplicate, the medial nerve falcate, about 5 mm. long, 8 mm. broad, pubescent with adpressed hairs on both faces and with numerous small calli near the anterior margin, the medial shortly petiolulate and tapering somewhat cuneately to the base. the lateral sessile, oblique or unequally

lobed. *Peduncles* as long as the leaves, glandular-pilose, articulated above the middle: bracts opposite. *Sepals* 5.5–6 mm. long, oblong, obtuse, glandular, with several reddish apical calli. *Corolla* 1.8–2.2 cm. long, violaceous. *Filaments* the longer 6 mm. long, broadly toothed. *Ovary* pubescent near the apex, with a few reddish calli: styles pubescent.

CALVINIA Div.; west of Hantam Berg, *Diels* 715 (type—Berlin).

A close affinity of *O. imbricata* E. & Z., but with broader and differently shaped leaflets. Not known to me in the living state.

\*30. *O. incerta* R. Knuth, Eng. Bot. Jahrb. LXI, Beibl. n. 139 (1927) 20. Stemless, 3–5 cm. high. *Rhizome* with a few small scales. *Leaves* 10–12, basal, glabrous: petioles about 1 cm. long: leaflets 3, obcordate-obreniform, 4 mm. long, 6 mm. broad, with small calli near the anterior margin. *Peduncle* sparsely pubescent, 2 cm. long, articulated above the middle: bracts opposite. *Sepals* lanceolate, 5 mm. long, glabrous. *Corolla* 1.6 mm. long, colour?

Locality unknown: *Ecklon*, in Berlin Herbarium.

One very poor specimen. It appears to have the habit of *O. imbricata* E. & Z., but the shape of the leaflets is distinctive. I include this rubbish with reluctance.

1200  
near  
Cape  
31. *O. orbicularis* Salter, Journ. of S.A. Bot. III (1937) 100. Slender, stemless, up to 12 cm. high. *Bulb* narrow-ovoid, with a long apical beak, the older bulbs persisting on the rhizome: tunics blackish-brown, the outer loose, undulate and tortuous, often splitting and so linear or ligulate. *Rhizome* glandular-pilose. *Leaves* few: petioles slender, glabrous or minutely glandular-pilose, 3–6 cm. long, swollen but not flattened below the basal articulation, slightly pulvinate at the apex: leaflets 3, shortly petiolulate, sub-orbicular, very broadly cuneate at the base, thin, minutely emarginate, with numerous elongate orange calli around the extreme margin, entirely glabrous or glandular-ciliate, usually with a pale, russet or purple medial streak above, veined and often purple below, the medial 1.1–1.3 cm. long, 1.3–1.6 cm. broad, the lateral a little smaller. *Peduncles* 1-flid., glabrous or minutely glandular-pilose, about twice as long as the leaves, with 2 minute bracts at an articulation a little above the middle. *Sepals* oblong-lanceolate, 3–4 mm. long pilose and ciliate particularly on the upper part, with 2 elongate reddish-brown converging apical calli. *Corolla* pale violaceous, 1.4–1.9 cm. long, with a yellow tube: petals narrow-cuneate, very slightly attenuate to the base, 4–5.5 mm. broad, sometimes with a narrow purple margin on the middle part. *Filaments*, the shorter 2.5–4 mm., the longer 3.5–6.5 mm. long, sparsely glandular-pilose, edentate. *Ovary* glabrous, the chambers 3–4-ovuled: styles with simple hairs below, glandular-pilose above. *Capsule* scarcely longer than the calyx. (Fig. 9.)

MONTAGU DIV. ; damp, shady places about Montagu, *S.* 2323. (*type* in Bol. Herb.), 1080, 1081 : SWELLENDAM DIV. ; Warm Baths, Barrydale, *L. Bolus* (B.H. 21019) : LADISMITH DIV. ; Anysberg, *Stokoe* 8009 (cult.). Fl. June.

Intermittent in its appearance and flowering but rarely.

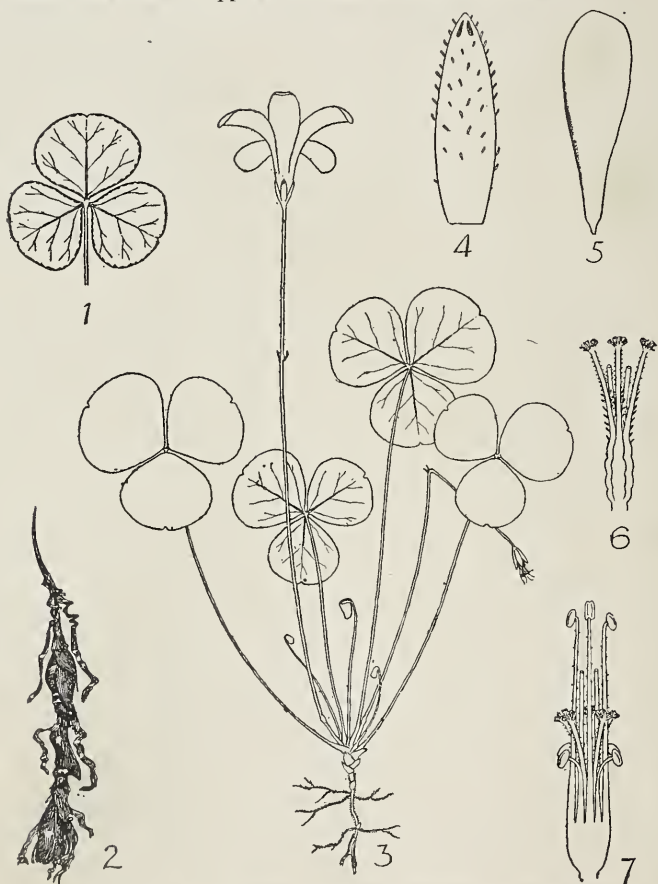


FIG. 9. *Oxalis orbicularis*, Salter. 1. Leaf (underside), natural size. 2. B lb, natural size. 3. Plant, natural size. 4. Sepal  $\times 8$ . 5. Petal  $\times 2$ . 6. Gynaecium  $\times 6$ . 7. Androecium  $\times 6$ . (Salter 2323.)

32. *O. Marlothii* Schltr. ex R. Knuth, Pflrch-Oxal. (1930) 362. Stemless, up to 19 cm. high. Bulb "1 cm. broad, more or less rotund" :

bulbils shortly beaked, lanate. *Rhizome* long, slender, pubescent. *Leave* basal, many: petioles glabrous, 3—12 cm. long: leaflets 3, broadly obcordate or triangular-obcordate, up to 1 cm. long, 1.3 cm. broad, broadly incised at the apex, glabrous above, sparsely adpressed-pubescent beneath. *Peduncles* many, 1-fl'd., 8—18 cm. long, adpressed-pubescent with minute ascending hairs on the upper part, subglabrous below: bracts 5—7 mm. long, opposite, at an articulation a little below the calyx. *Sepals* lanceolate, acute, usually 7—8 mm. long, adpressed-pubescent with minute ascending hairs, glabrescent towards the margins, eciliate, ecallose. *Corolla* 2.5—3 (?) cm. long, glabrous, rosy-violet (dried), with a widely funnel-shaped yellow tube: petals subcuneate, attenuate below, rounded or obliquely subtruncate at the apex. *Filaments*, the longer pubescent, toothed. *Ovary* cylindrical, 3 mm. long, shortly stipitate, minutely pubescent on the upper part, callose at the apex, the chambers several-ovuled: styles densely pubescent (longistylar form only seen).

SUTHERLAND DIV.; Roggeveld, Sneeuw Krans, Uitkyk Farm, 1700 m., Marloth 9909 (type—Berlin).

The original description has been amplified from the three specimens in the National Herb., Pretoria. It is only known to me from dried specimens and I have not seen a mature bulb. The species seems to resemble superficially *O. obtusa* Jacq., Form B., (*O. Framesii* L. Bolus).

33. *O. obtusa* Jacq. Oxal. (1794) 106, t. 79, f. 1. (*A Group-species*).—*O. cuprea* Lodd.—*O. Piottae* Colla\* (as figured in Bot. Reg. t. 1817)—*O. cruentata* Jacq. f.—*O. thermarum* E. & Z.—*O. lacunosa* E. & Z.—*O. ciliariflora* E. & Z.—*O. fimbriata* Phillips—*O. Pearsonii* R. Knuth (non Bolus f.)—*O. cuneiformis* Salter & Exell—*O. Framesii* L. Bolus—*O. membranacea* Weintraub—*O. fugax* Schltr. ex R. Knuth—*O. Schultzii* R. Knuth—*O. rondeboschensis* R. Knuth—*O. obtusa* Jacq., vars. *subvillosa* Sond., *glabrata* Sond., *hantamensis* R. Knuth. A rather lax plant, usually 5—15 cm. high. *Bulb* oval with attenuate points at the base and apex, often fusiform, with hard blackish-brown tunics, deeply pitted and irregularly angled, glabrous or rarely sparsely pilose with simple and short capitate hairs. *Rhizome* short, rarely up to 10 cm. long, producing bulbils freely in the axils of the scales. *Stem* either not exerted, forming a short stipe or, particularly in shade and mountain forms, elongated to 10 cm. or more long, leafless, slender, always pilose with soft reversed hairs. *Leaves* 10—20, rarely up to 60, basal or congested at the apex of the stem, or very rarely imbricating on a short stipe: petioles 2—4 cm. long or longer in shade forms, articulated to a scale-

\*Artificial hybridisation between *O. Piottae* and *O. obtusa* is recorded by Hildebrand, but they are probably conspecific.



like and sometimes pseudo-stipulate base, pilose with soft reversed hairs, or very rarely with patent, ascending or short glandular-capitate hairs: leaflets 3 (or in var.  $\beta$ , 5), shortly petiolulate, 0.5—2.5 cm. long, obcordate, cuneate-obcordate or oblong-obcordate, sometimes triangular in outline, bilobed to the middle, often heterophyllous, the early leaflets obcordate, the later elongating to narrow-cuneate or linear emarginate, varying from closely silky-pubescent on both faces to entirely glabrous, more or less impresso-punctate when dried, variously callus-dotted or ecallose, occasionally purplish beneath and rarely purple-mottled above. *Peduncles* about twice as long as the leaves, softly pilose with reversed hairs, rarely with short capitate hairs admixed: bracts 2, opposite, at an articulation above the middle. *Sepals* oblong or oblong-lanceolate, obtuse or subacute,  $1/3$  to  $1/4$  the length of the corolla, softly pilose with ascending hairs, always with some reversed hairs at the base, ciliate, ecallose or very rarely with apical calli. *Corolla* 1.5—2.5 cm., usually about 2 cm. long, pink, brick-red or palish yellow: tube short, more or less widely or rarely narrowly funnel-shaped, yellow: petals subcuneate, with variable attenuation into a short claw, obliquely subtruncate at the apex, glabrous or very rarely pilose near the outer margin, often purple-veined beneath. *Filaments* often glandular-pubescent, the longer either edentate, gibbose or even with teeth over 1 mm. long, the longest (or styles) well exerted from the corolla tube. *Ovary* pubescent on the upper part, ecallose, the chambers many-ovuled: styles usually with simple and short capitate hairs admixed. *Capsule* oblong, not or scarcely exerted beyond the calyx. Seeds endospermous. Sometimes producing double flowers.

NAMAQUALAND; Scully 19, 34, *B.H.* 19197, *P. Sl. Mem. Ex.* 6674, 6676 (*O. Pearsonii* R. Knuth) 6645, 6675, Marloth 6747, Compton 5512, Schultz (*O. Schultzii* R. Knuth), *Schltr.* 836 at Berlin (*O. rondeboschensis* R. Knuth) a false ticket, *S.* 802, 809, 849, 891, 893, 899, 910, 1408, 1466, 1481, 1486, 1503, 1539, 2532, 2565, 2570, 2571, 2574, 2577, 2578, 2583, 2586, 2589, 3703, 3729, 3738, 3751, 3797, 3812, 3813, 4579, 5508: CALVINIA DIV.; *S.A.M.* 21666, *B.H.* 19620, Meyer a. 1869 (*O. obtusa* Jacq., var. *hantamensis* R. Knuth), *S.* 2477, 3478, 3499, 3502: SUTHERLAND DIV.; Marloth 9644 (*O. fugax* Schltr. ex R. Knuth) 9588: V. R's. DORP DIV.; *Schltr.* 8238, *P. Sl. Mem. Ex.* 7478 (*O. fimbriata* Phillips) 7476, *S.* 702A, 721, 942, 1578, 1613B, 1614, 1641, 2494, 2516, 3389, 7288, 7317: CLANW. DIV.; Drège (*O. plagiantha* E. Mey M.S.), Bolus 8953, Leipoldt 292, E. & Z. 726 (*O. natans* E. & Z.), E. & Z. 734 (*O. lacunosa* E. & Z.), Pillans 9041, *B.H.* 21477, 21478, 21517, 21518, 21519, 21520, *S.* 693, 735, 1362, 2451, 2459, 2471, 2726, 3519: PRQB. DIV.; *Schltr.* 10736, Pillans 7361, 7411, 7859: MALMESB. DIV.; Bachmann



1147, *Pillans* 6883, 6976, *S.* 1037, 1309, 1313, 1341 : TULBAGH DIV. ; *S.* 1708, 6145 : CAPE PENIN. *E. & Z.* 735 (*O. cuprea* E. & Z.), 732, *MacO.* 1815, *Bolus* 3695, *W-Dod* 66, 72, 1299, *Guthrie* 567, *Phillips* 717, *Schltr.* 1048, 1252, *Marloth* 145, *Pillans* 2534, *S.* 244/8, 1285, 1304, 2680, 2825, 6399 : STELLENBOSCH DIV. ; *Garside* 4608 : PAARL DIV. ; *Phillips* 8273, *S.* 1334 : CALEDON DIV. ; *E. & Z.* 733 (*O. thermarum* E. & Z.), *Zey.* 2107 ex pte., 2109, 2111, *Bolus* 8503, *B.H.* 14767, 20025, 20026, 21521, 21522, *Muir* 4997, *Marloth* 7051, *Galpin* 3836, *S.* 1130, 1160, 1188, 6171, 6175, 6212 : RIVERSDALE DIV. ; *Muir* 1577, 1583, 1625, 3653 (*O. membranacea* Weintroub) : M. BAY DIV. ; *Galpin* 3835, *S.* 371/28 (*O. cuneiformis* Salter & Exell) : UNIONDALE DIV. ; *Fourcade* 1656 : GEORGE ; *Rogers* 4373 ; KNYSNA ; *Duthie* 1220, 1224 : P. ELIZ. AND Uitenhage DIVS. ; *E. & Z.* 737 (*O. ciliariflora* E. & Z.), *Zey.* 2122, *Paterson*, 2081, 2308, 3187, 3422 : CERES DIV. ; *Marloth* 6079, 9078, *S.* 2285, 2639, 4690 : LAINGSBURG DIV. ; *B.H.* 19202, *Compton* 2843 ; 3260 : WORCES. DIV. ; *Rogers* 16750 : MONTAGU ; *Mitchell* 309, *B.H.* 18623, *S.* 1082, 1050 : LADISMITH ; *Phillips* 9145, ? loc ; *Zey.* 232. Fl. June—Oct.

FORM B. *Flowers* much larger, white, pale rose or yellow. *Leaflets* always heterophyllous.

NAMAQUALAND : *White or pale rose.* *B.H.* 19130 (*O. Framesii* L. *Bolus*), *Schltr.* 11256, *Bolus* 9648, 9649, *Marloth* 6705, 6771, *Henrici* 2181, *Pillans* 6248, *S.A.M.* 14644, *Compton* 5513, *S.* 1295, 1467, 3722, 3749 ; *pale yellow*, *S.* 3400. Fl. Sep.

Var.  $\beta$  *atrata* (Weintroub) Salter.—*O. atrata* Weintroub. Stemless. *Leaflets* 5, heterophyllous, obcordate, cuneate, oblong or linear up to 1.6 cm. long. *Corolla* pale yellow, veined, 1.1—2 cm. long, with a widely funnel-shaped tube. *Filaments*, the longer 8.5 mm. long, well exerted from the corolla tube, with rather acute teeth about 0.5 mm. long.

NAMAQUALAND : near Steinkopf, *Pillans* (*B.H.* 19227), *type* in *Bolus* Herb.) *S.* 2584. Fl. July.

In some specimens the leaflets are all obcordate. The variety only differs from such Namaqualand specimens as *S.* 893, 1503, 2574, 2577, 2586, 2589, 3751, in having 5-foliolate leaves.

This species is perhaps the commonest and most widespread of the whole genus in South Africa. The characters by which it may be distinguished are as follows :—

*Invariably.*

- (i) Bulb irregularly pitted and sharply angled.
- (ii) Longest stamens (or styles) well exerted from the corolla.
- (iii) Ovary without calli.

*O. ligulata?*  
see p. 328.

*Almost invariably.*

- (iv) Reversed hairs on the stem, petioles and peduncles and at the base of the sepals.
- (v) The presence of flavone in the petals, affected to a greater or less degree by anthocyanin staining.

and there is a marked, though not invariable tendency to heterophylly the early leaflets being obcordate or cuneate-obcordate, the later lengthening to narrow-cuneate, oblong or linear. Some forms are certainly not heterophyllous.

In other respects it assumes a bewildering number of forms in which the variable characters (*vide* revised description) are combined in so many different ways, though never apparently in constant groups, that, at the present juncture, it seems inadvisable to attempt to create an infinite number of varieties. It is, indeed, doubtful whether extended exploration and intensive study of many thousands of plants, both in the field and in cultivation, will ever lead to a workable taxonomic classification and certainly not until more detailed field observation of the heterophylly of the species has been made. Both large and also dwarf forms occur and the fact that these retain their approximate size in cultivation shows that these variations are not epharmonic. In some colonies the production of a stem appears to be confined to shade specimens, but other colonies, with the plants all caulescent, may be found in the open.

The typical form, that illustrated by Jacquin (tab. 79), is the commonest in the extreme south west, the corolla being usually brick-red. Chance specimens gathered in outlying localities would often be unlikely, on their own evidence, to be recognised as belonging to the same species, especially in the dried state, and there is no doubt that they would be definite variations from the type. Moderately extensive collecting and observation, has, however, shown that almost every such gathering is a new form. In the past, on the variations observed over a limited quantity of herbarium material (sometimes without bulbs) a number of species and varieties have been created and, with the exception of the 5-foliate variety *atrata*, in none of these, when weighed in conjunction with the mass of intermediates, can I find characters which are sufficiently individual to warrant taxonomic separation.

The names of the various species amalgamated here will be found in the list of synonyms given above. No useful purpose would be served, nor does space permit of pointing out their separate characters, for they merge into one another and are no more worthy of separate notice than all the other variants. Some of them owe their origin to the unawareness of their authors of heterophylly in the species, for it is only in the de-

scription of *O. Framesii* L. Bolus, that there is any reference to it.

*O. Framesii*, with very large pale rose or white flowers, without any trace of flavone in the petals, is perhaps worthy of special notice. The discovery of a form of this, exactly similar in all respects except that the flowers are pale sulphur-yellow (S. 3400), shows that it would be inconsistent to give this form varietal status. *O. rondeboschensis* R. Knuth, though the colour of the corolla in the *type* is not now discernible, is near this form and it has evidently been so named through an accidental interchanging of Schlechter's ticket (No. 836) in Berlin Herbarium. It cannot have come from the suburbs of Cape Town.

Some forms found in northern Namaqualand, e.g. S. 891, 4579, flower in June—July, considerably earlier than the normal flowering season, viz. Aug.—Oct. These forms have very thick leaflets and they appear in other characters as well to be extreme variants. Owing, however, to the discovery of a number of intermediates with other forms it is not considered feasible to separate them. Others from the same region are characterised by the presence of capitate hairs, particularly on the peduncles, but a marked tendency has been noticed for such hairs to become more numerous and spread to the whole plant in cultivation and they are not accompanied by any other exceptional character.

This species is one of the few in which I have found the teeth on the longer filaments to be variable and unreliable as a character. Many forms are entirely without teeth, while others vary from gibbose swellings to teeth over 1 mm. long, a fact which seems to suggest that extensive mutation is taking place.

34. *O. lanata* L. f., Supp. (1781) 244. Jacq. Oxal. 104, t. 77, f. 2. Erect, stem usually exserted, 6—13 cm. high, rather densely villosopubescent. *Bulb* ovoid, about 1 cm. long, usually with a long beak at the apex, the brown tunics more or less lanate. *Rhizome* long, fragile and filiform in the lower part. *Stem* 1—9 cm. long, occasionally not exserted, rarely branching, villose or hirsute, with a few scales. *Leaves* few or many, apically congested: petioles often 2—4 cm. long, sometimes longer, like the peduncles densely villose, usually with yellowish hairs: leaflets 3, very shortly petiolulate, broadly obcordate, often cuneate at the base, not deeply incised at the apex, usually 0·6—1 cm. long, 0·8—1·2 cm. broad, adpresso-pubescent on both faces. *Peduncles* 1-fl., generally about twice as long as the leaves, with 2 opposite bracts at an articulation rather above the middle. *Sepals* broadly lanceolate, 4—6 mm. long, pilose, ecallose. *Corolla* 1·6—2·4 cm. long, white, with a rather broadly funnel-shaped pubescent yellow tube: petals sub-cuneate, 0·7—1 cm. broad, pubescent and sometimes pale rose along the outer margin beneath. *Filaments*, the shorter 2—3·5 mm., the longer

3.5—6.5 mm. long, very sparsely glandular-pilose, gibbose or shortly and obtusely toothed. *Ovary* densely cano-pubescent, the chambers 6—7-ovuled: styles pubescent. Seeds endospermous.

CAPE PENIN.: *E. & Z.* 721, *MacO.* 1740, *Bolus* 3694, *Schltr.* 1504, *B.H.* 22208, *W-Dod* 65, *S.* 244/9, 996, 1002, 1286, 2701, 4871, 6164: MALMESB. DIV.; Conterberg, *Pillans* 6884. Fl. May—Oct.

Var. *β rosea* Salter, *Journ. of S.A. Bot.* III (1938) 18, Petals rose red, 1.5—3 cm. long 0.8—1.4 cm. broad, the laminae obovate, with a distinct claw. (Fig. 10.)

CAPE PENIN.; Wynberg Hill, *F. Bolus* (B.H. 22159, type) *W-Dod* 1379, *S.* 992, 5415, 6162: STELLENBOSCH DIV.; *Parker* 3686, Sir Lowry Pass, *S.* 3289, *Schltr.* 1139 and 4802 (erroneously attributed in *Pfirsch-Ox.* to *O. truncatula* Jacq.), Steenbrass, *S.* 4743: CALEDON DIV.; *B.H.*

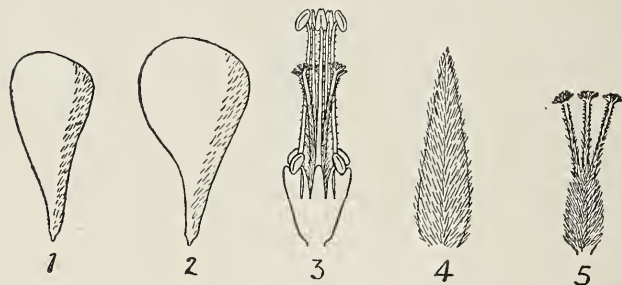


FIG. 10. *Oxalis lanata* L.f. (white) petal  $\times 1\frac{1}{2}$ . 2. *O. lanata*, var. *rosea* petal  $\times 1\frac{1}{2}$ . 3. Androecium  $\times 5$ . 4. Sepal  $\times 5$ . 5. Gynaecium  $\times 5$ .

22160, *S.* 6214: WORCES. DIV.; Bain's Kloof, *S.* 4777, 6833: PAARL DIV.; *S.* 6888, 6889, *Guthrie* 2021, Artois, *Bolus* 7577. Fl. May—Oct. (usually Aug.—Oct.).

This variety has often been confused with *O. truncatula* Jacq., but it is an affinity of *O. heterophylla* D.C., Form B.

A teratological form of *O. lanata* with virescent flowers (*S.* 1340, 6163), which has leaf-like sepals and petals, occurs in great abundance near the Kirstenbosch Herbarium. (See Introduction, Part IX, Teratology and Fig. 1.)

35. *O. truncatula* Jacq. *Oxal.* (1794) 99, t. 62.—*O. holosericea* E. Mey. ex Sond.—*O. crassifolia* E. & Z.—*O. Sonderi* R. Knuth. Stemless, or the stem shortly exserted, 10—12 cm. high, densely silky villose, the hairs often turning rusty in dried specimens. *Bulb*, when mature, ovoid-conical, rostrate, up to 5 cm. long, the younger narrow-conical: tunics



rather loose, hard, imbricating, dark brown, often vertically ridged. *Rhizome* 4—12 cm. long, pubescent, with rather large semiamplexicaul scales. *Leaves* 2—8, rosulate; petioles 1—6 cm. long, densely pilose: leaflets 3, subsessile, rather thick, triangular, triangular-obcordate or very broadly cuneate-obovate, truncate and sometimes emarginate, lightly retuse or rarely obcordately incised on the anterior margin, commonly 0·8—1 cm. long, 1—1·7 cm. broad, increasing in size after the flowering period, densely silky and usually violaceous beneath, more thinly adpressed-silky or rarely glabrous above, densely ciliate. *Peduncles* 1-fl., 2—10 cm. long, villous, with 2 subulate opposite bracts at an articulation on the upper part. *Sepals* broadly lanceolate, sometimes obtuse, about 5 mm. long, densely villous, with numerous elongate reddish calli on the upper part and near the margins, often concealed by the hairs. *Corolla* 1·4—2·4 cm. long, pubescent, rather pale violet, with a broadish funnel-shaped yellow tube: laminae of the petals cuneate or cuneate-obovate, obliquely truncate, twice as long as the tapering claw. *Filaments* minutely glandular-pilose, the shorter 2—4·5 mm., the longer 4—7 mm. long, with short obtuse or truncate teeth. *Ovary* thickly pilose on the upper half, the chambers 2-ovuled: styles pubescent. *Capsule* subglobose, shorter than the calyx. Seeds endospermous.

CALEDON DIV.; *E. & Z.* 723 (*O. crassifolia* E. & Z.), *Zey.*, Knoblauch (*O. Sonderi* R. Knuth, *O. holosericea* Sond.) *Schltr.* 7792, *Bolus* 7463, *Galpin* 12675, *F. Guthrie* 2230, *B.H.* 15124, 20411, 21870, *Bond* 997, *S* 603, 2116, 2399, 3071, 3288, 4390, 6031, 6035, 7202, 7210: BREDASDORP DIV.; *Schltr.* 10470, *B.H.* 20436: PAARL DIV.; *Galpin* 11070, *B.H.* 22659. Fl. April—June.

*Note*:—*Schltr.* 1139 and 4802, attributed to this species in Pflsch-Ox., are *O. lanata* Lf., var *rosea*.

The species is somewhat variable, particularly in the size, shape and indument of the leaflets. The hairs in many specimens turn rusty in drying. The leaflets in some forms, particularly in the vicinity of Hermanus, Caledon Div., increase greatly in size (up to 4 cm. in diam.) after the flowering period and lose their characteristic colour on the under surface. I have no hesitation in including *O. Sonderi* R. Knuth (*O. holosericea* Sond.) here. The type, *Zey.*, Knoblauch, in Sonder's herbarium is a lanky shade form, but it is now no longer "shining and yellow".

36. *O. lasiorrhiza* Salter, Journ. of S.A. Bot. I (1935) 124. Stemless, hirsute, up to 4 cm. high. *Bulb* ovoid, beaked at the apex, up to 2 cm. long: tunics pale brown, with prominent paler brown longitudinal nerves. *Rhizome* about 30 cm. long or more, 1·5 mm. thick, patent-pubescent, with pubescent scales. *Leaves* up to 30: petioles up to 2·5 cm. long, densely hirsute with yellowish hairs, the outer conspicuously



widened and scale-like below the basal articulation, terete above: leaflets 3, shortly petiolulate, thick, broadly cuneate-obcordate or obdeltoid-obcordate, very slightly and widely indented or subtruncate on the anterior margin, about 0.8 cm. long, 1 cm. broad, strigose-sericeous above, densely sericeous beneath and on the margin, concolorous. *Peduncles* 1-fl'd., 1—2 cm. long, densely hirsute, with 2 opposite linear pilose bracts at an upper articulation above the middle. *Sepals* broadly lanceolate, 5—6 mm. long, densely hirsute, ecallose. *Corolla* 2—2.5 cm. long, sulphur yellow, concolorous, with a widely funnel-shaped tube: petals obliquely cuneate, 1—1.3 cm. broad, rounded at the apex, pubes-

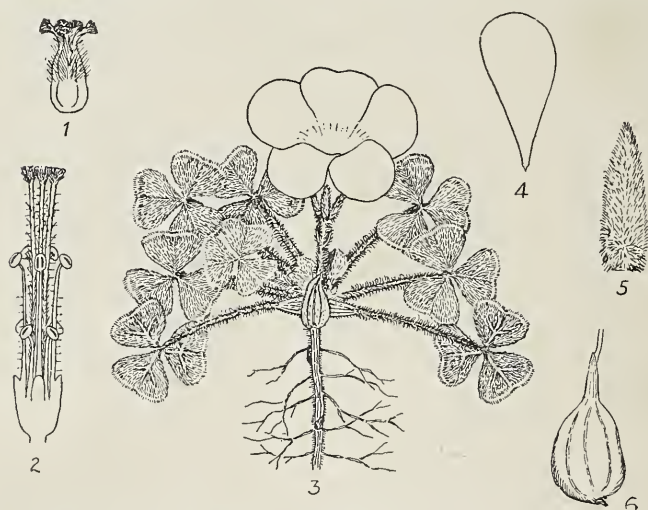


FIG. 11. *Oxalis lasiorrhiza* Salter. 1. Gynaecium  $\times 6$ . 2. Androecium showing long styles  $\times 6$ . 3. Plant, natural size. 4. Petal, natural size. 5. Sepal  $\times 4$ . 6. Bulb, natural size. (Salter 4555.)

cent near the outer margin beneath. *Filaments*, the shorter 3—4.5 mm., the longer 4.5—7.5 mm. long, sparsely pluricellular-pilose, with short subobtusate teeth. *Ovary* densely cano-pilose on the upper half, the chambers 2—3-ovuled: styles with simple and pluricellular hairs admixed. *Capsule* not exerted. Seeds endospermous. (Fig. 11.)

CALVINIA DIV.; 8 miles north-east of Nieuwoudtville, amongst bushes, S. 4555 (*type* in Bol. Herb.). Fl. June.

✓ 37. *O. strigosa* Salter, Journ. of S.A. Bot. I (1935) 122. Robust, stemless. *Bulbs* (young) elongate, lanceolate in outline, tortuous, about

8 cm. long, with a long curved apical beak : tunics papery, transversely wrinkled, particularly about the middle, glandular-pilose, pale brown, the beak dark brown, smooth, up to 3 cm. long : mature bulb very large, subcylindrical, about 2 cm. in diam., with a contractile root. *Rhizome* stout, very long, up to 55 cm. or more long, hirsute at the extreme apex only, with a thick brown cortex, the upper scales obcordate, hirsute : rootlets rather thick. *Leaves* up to 20 ; petioles often 4—6 cm. long, slightly flattened, densely hirsute : leaflets 3, shortly petiolulate, broadly obcordate or obdeltoid-obcordate, very slightly and widely indented or subtruncate on the upper margin, 0·9—1·5 cm. long, 1·2—2·1 cm. broad, minutely punctate, concolorous, strigose-hirsute, particularly on the veins beneath, with long hyaline strigose bristly hairs above and on the margins. *Peduncles* few, 1-fl., more slender than the petioles, 3—7 cm. long, adpressed-pilose, with 2 alternate hairy rubro-callose bracts above the middle, the upper part deflexed after flowering. *Sepals* ovate-oblong, 5—6 mm. long, hirsute, with several elongate red calli on the upper half, the margins dark purple. *Corolla* up to 2·5 cm. long, glabrous, rose-red, with a yellowish purple-streaked funnel-shaped tube : laminae of the petals cuneate, obliquely truncate, often slightly reflexed, up to 1 cm. broad, narrowly purple-margined beneath, longer than the attenuate claw. *Filaments*, the shorter 2·5—5 mm., the longer 5—6·5 mm. long, glandular-pilose on the outer side, with broad obtuse teeth. *Ovary* sparsely glandular below, hirsute above, with a few red calli near the apex, the chambers 2-ovuled : styles hirsute : stigmas small, green. *Capsule* globose, densely hirsute. Seeds with thin endosperm, the embryo green. (Fig. 12.)

CAPE DIV. ; on southern slopes of Tygerberg, 900—1000 ft., *S.* 557 (type in Bol. Herb.), *Pillans* 4751, Kanon Berg, *S.* 522, Hercules Pillar, *S.* 8745, *Acock* 4450. Fl. Apl.—May.

Although the bracts on the peduncle are alternate, this species closely resembles the two foregoing. The endospermous seeds and the reflexing of the peduncle show that it is most closely related to this section. The bulb shown in the figure cited above is not mature.

Specimens without flowers from Hoenderhoek, Roggeveld, (*Marl.* 9756) are closely related to this species, having a similar bulb, but the leaflets are very densely hairy beneath and not punctate.

38. *O. zeekoevleyensis* R. Knuth, Eng. Bot. Jahrb. LXI. Beibl. n. 139 (1927) 18. (Journ. of S.A. Bot. VII (1941) 161). Stemless. *Bulb* with a contractile root, narrow-oval or ovoid, shortly attenuate at the apex, up to 2 cm. long : outer tunics blackish brown, the inner papery and paler. *Rhizome* 10—20 cm. long, with minute scales. *Leaves* numerous : petioles up to 4 cm. long, often somewhat compressed, sparsely

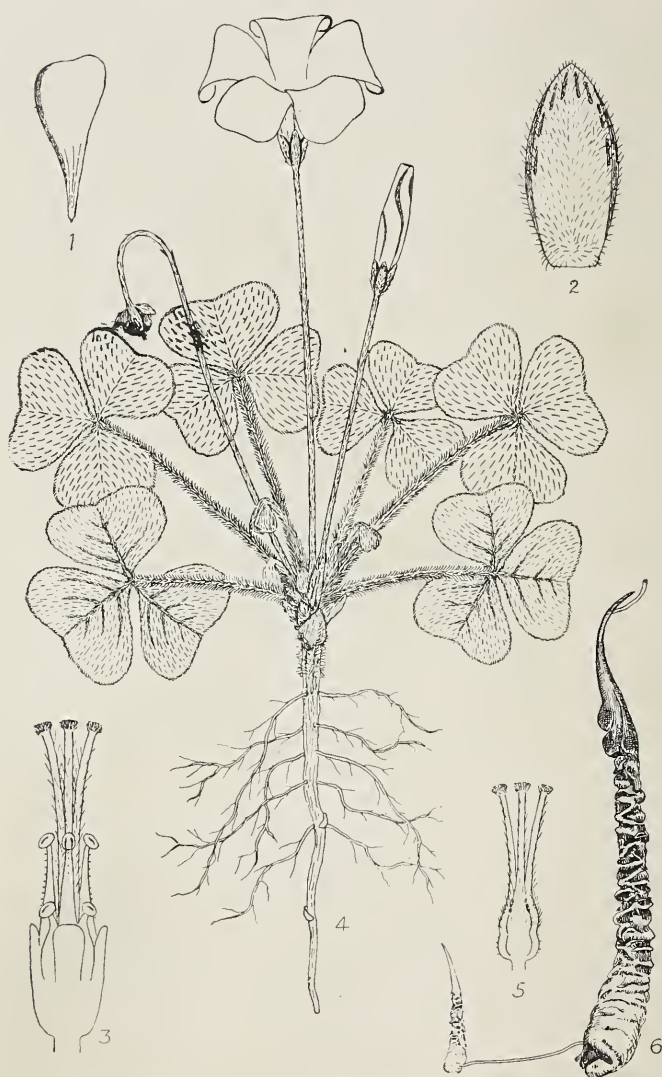


FIG. 12. *Oxalis strigosa* Salter. 1. Petal, natural size. 2. Sepal  $\times 6$ . 3. Androecium showing long styles  $\times 6$ . 4. Plant, natural size. 5. Gynaecium with medium styles  $\times 6$ . 6. Young bulb, natural size. (Salter 557.)

villose, dilated below the basal articulation: leaflets 3, 0·6—1 cm. long, 0·8—1·2 cm. broad, glabrous or sparsely villose above, villose beneath particularly on the medial nerve, ciliate, sometimes minutely brown-dotted, the medial shortly petiolulate, broadly obovate, the lateral suboblique. *Peduncles* 1-flid., twice as long as the leaves, villose, with 2 linear alternate orange-callose bracts, up to 2·5 mm. long, on the upper part, the bud cernuous. *Sepals* broadly lanceolate, 4—5 mm. long, glabrous or sparsely villose, often ciliate on the lower half, with 2 orange-brown apical calli. *Corolla* 2·5—3 cm. long, glabrous, rosy-lilac, with a funnel-shaped yellow tube: laminae of the petals obliquely obovate, 1·2—1·4 cm. broad, slightly purple along the outer margin beneath, rather longer than the narrow-cuneate claw. *Filaments*, the shorter 2·5—4·5 mm., the longer 4·5—7·5 mm. long, the longest rostrate or recurved at the apex, glandular-pilose on the outer edge, edentate. *Ovary* glandular-pilose, with longer simple hairs towards the apex, the chambers about 12-ovuled: longest styles glandular, often with simple hairs admixed. *Capsule* oblong. Seeds endospermous. (Fig. 13.)

BREDASDORP DIV.; Zeekoevley, *Schltr.* 10548 (*type*—Berlin): CALEDON DIV.; Hartebeesterivier, *Zey.* 2110 (falsely attributed by Sonder to *O. imbricata* E. & Z.), about Caledon, *B.H.* 21863, *S.A.M.* 45928, *S.* 1225, 2395, 3101, 3103, 6174, 6177, 6699: RIVERSDALE DIV.; *Muir.* 2590, 2592. Fl. June—Aug.

Superficially similar to *O. imbricata* E. & Z., var  $\beta$ , for which it may easily be mistaken. It is, however, rather more succulent than that species and also differs in having alternate bracts on the peduncle, edentate filaments, the longest in the short and medio-stylar forus being rostrate or recurved at the apex. The corolla is a pale rosy-lilac, not the clear rose of *O. imbricata*, the bulbs are much smaller and the tunics do not tend to split into fibrous segments at the base. It is plentiful in rather damp situations about Caledon.

As in the foregoing species the bracts are alternate, but the endospermous seeds and the cernuous bud show that it is related to this Section. After pollination the peduncle deflexes both at the lower articulation and also in the upper part as in the six following species.

\* 39. *O. virginea* Jacq., Hort. Schoenbr. III (1798) 13, t. 275. Caulescent, 4—6 cm. high. *Bulbs* lanceolate in outline, sharply acute, commonly 4 cm. long, often massed together: tunics lanceolate, needle-pointed, loose and separable, the inner brown, the outer blackish, those of the older dead bulbs often imbricating those of the living through the action of the contractile root. *Rhizome* thickish, up to 12 cm. long, with numerous semiamplexicaul scales. *Stem* 1—4 cm. (up to 12 cm.

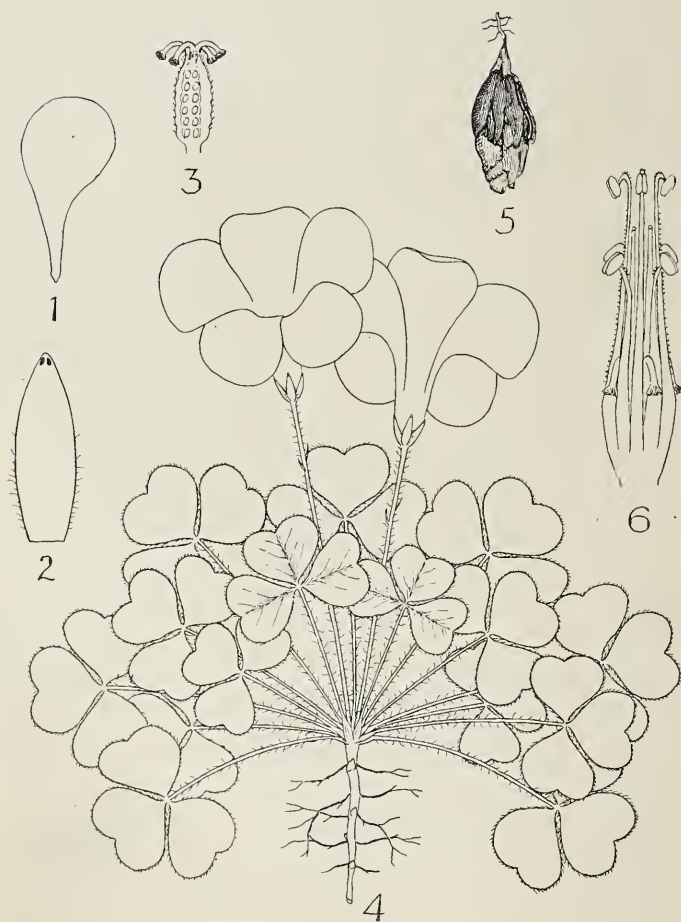


FIG. 13. *O. zeekoevleyensis* R. Knuth. 1. Petal, natural size. 2. Sepal  $\times 6$ . 3. Gynaecium  $\times 6$ . 4. Plant, natural size. 5. Bulb, natural size. 6. Androecium  $\times 6$ . (Salter 1225.)



long in cult.), often branched, densely hirsute. *Leaves* terminally clustered at the apex of the stem or branches, with some cauline, alternate: petioles 0·5—1 cm. long, hirsute: leaflets 3, sessile, the medial cuneate, rounded at the apex, rarely slightly emarginate, up to 2·5 cm. long, 1 cm. broad, the lateral obliquely oblong, about half as large, adpresso-pubescent on both sides, softly ciliate, minutely nigro-punctate. *Peduncles* 1-fld., terminal, filiform, scarcely 1 cm. long, pubescent, with 2 slender opposite clavate callus-tipped bracts, about 2·5 mm. long, at an articulation close to the calyx. *Sepals* oblong-lanceolate, 3·5—5 mm. long, pubescent, ecallose, often unequal. *Corolla* 1·3—1·5 cm. long, pubescent, white, with a short widely funnel-shaped tube: petals obliquely cuneate, scarcely attenuate below, obliquely truncate at the apex, about 4 mm. broad. *Filaments*, the shorter 1·7—2·5 mm., the longer 3—4·5 mm. long, minutely glandular-pilose, edentate. *Ovary* pubescent on the upper half, with 5 red calli near the apex, the chambers 2-ovuled: styles pubescent below, minutely glandular-pilose above. Seeds endospermous.

NAMAQUALAND; hills near Garies, *Caporn* (B.H. 15113), S. 1572 (cult.), 3401, 6653. Fl. June—July.

Apparently rather local. The species is quite distinct from though related to *O. ambigua* Jacq. No type specimen was preserved in Herb. Jacq., but my specimens, particularly those cultivated, are an exact match of his figure, except that the bulbs are not vertically ridged as depicted.

\* 40. *O. ambigua* Jacq. Oxal. (1794) 80, t. 43.—*O. mutabilis* Sond. A group-species. Further synonymy given under the different Forms. Stemless or the stem sometimes shortly exserted, usually 4—12 cm. high, more or less finely pubescent, more rarely with some glandular hairs admixed or almost all the hairs glandular. *Bulb* ovoid, acute at the base and apex, often 2—4 cm. long, with hardish dark brown gummy tunics. *Stem* scarcely exserted or more often 1—2 cm. long or longer, robust, fleshy, leafless, with a few semiamplexicaul scales. *Leaves* 15—30, clustered at the apex of the stem, with petioles 2—6 cm. long: leaflets 3, often emarginate, pubescent on both sides, ciliate with simple or rarely glandular hairs, rarely purple-mottled, sprinkled on the under side with numerous small blackish dots (sometimes with translucent red centres), the medial shortly petiolulate, cuneate-rotund, cuneate-obovate or cuneate-oblong, often tapering attenuately to the base, 0·5—2·5 cm. long, 0·5—1·1 cm. broad, or rarely oblong, 4—7 times as long as broad; the lateral subsessile, oblique, usually rather smaller. *Peduncles* 1-fld., shorter or longer than the leaves, with 2 small opposite bracts at an articulation above the middle. *Sepals* lanceolate, 4—5 mm. long, ciliate, minutely bicallose at the apex. *Corolla* 1·8—2·8 cm. long, white, yellow

or cream-coloured, with a rather widely funnel-shaped yellow tube: laminae of the petals broadly cuneate-obovate, purple-striate towards the outer margin, rather longer than the tapering claw. *Filaments*, the shorter 2.5—4.5 mm., the longer 4—7.5 mm. long, glabrous or minutely glandular-pilose, with rather long subacute teeth. *Ovary* pubescent on the upper part, with numerous orange-red calli reaching nearly to the base, the chambers about 9-ovuled: styles pubescent below, glandular-pilose above. *Capsule* not exerted. Seeds endospermous.

FORM A. *O. undulata* Jacq.\*—*O. exaltata* Jacq.—*O. flaccida* Jacq.—*O. ferruginata* Jacq. Pubescence simple. *Medial leaflet* cuneate-obovate. *Corolla* white, yellow or rarely cream-coloured.

NAMAQUALAND: Kamieskroon area, *white*, *S.* 1574; Garies area, *yellow*, *S.* 6665, *cream*, *S.* 6662. Fl. June—July.

*The following are intermediate with Form B.*—

Garies area, *yellow*, *B.H.* 14633, *S.* 6656.

FORM B. *O. tricolor* Jacq.—*O. rubro-flava* Jacq.—*O. mutabilis* Sond., var. *tricolor* (Jacq.) R. Knuth. Pubescence simple, *Medial leaflet* cuneate-oblong, up to 2.5 cm. long, 4 to 7 times as long as broad. *Corolla* yellow.

NAMAQUALAND: Garies area, *Pillans* (*B.H.* 22304), *S.* 1573, 2529, 5574.

FORM C. Pubescence simple, more rarely with glandular hairs admixed. *Medial leaflet* cuneate-rotund. *Corolla* yellow.

NAMAQUALAND: Garies area, *S.* 2522, 2527 (*densely glandular*), 3394, 3395, 3407, 5576: V.R.'s DORP DIV.; Bitterfontein area, *S.* 922A, 2520.

FORM D. *O. glandulosa* Jacq. Indument glandular, with a few simple hairs on the leaflets. *Leaflets* often purple-mottled, the medial cuneate-obovate. *Corolla* white.

NAMAQUALAND: 24 miles west of Garies, *S.* 6668.

Var.  $\beta$  *fuscata* (Jacq) Salter—*O. fuscata* Jacq.—*O. strumosa* Jacq. and var. *brevipes* L. Bolus—*O. mutabilis* Sond., var. *fuscata* (Jacq.) R. Knuth. Pubescence simple. *Leaflets* greyish, copiously purple-mottled, the medial cuneate-rotund. *Sepals* often attenuate towards the apex. *Corolla* white. *Filaments* with rather shorter teeth.

NAMAQUALAND: Kamieskroon area, *L. Bolus* (*B.H.* 19128, *O. strumosa* Jacq., var. *brevipes* L. Bolus), *B.H.* 19902, *S.* 803B, 807, 870B, 2558. (Often growing in rock crevices.) Fl. June—July.

Var. *penicillata* R. Knuth (*Zey.* 2128, Kammas) is not this species,

\*No specimens have been found corresponding exactly with *O. undulata* Jacq. Similar enlargement of one or two sepals sometimes occurs in *O. flabellifolia* Jacq., *O. fabacifolia* Jacq., and *O. purpurea* L.

but *O. adenodes* Sond., Form E. Zeyher's specimens from Grootriet and Eenkoker (in Herb. Sond.) are so old and poor as to be indistinguishable, but they cannot be placed here. Except in the shape of the flat leaflets, which are obreniform with a marked attenuate tapering to the base, they resemble *O. crispula* Sond. more than any other species. It is to be hoped that this plant will be re-discovered. I have unfortunately not seen the other specimens cited by Sonder.

Sonder's apt name, *mutabilis*, for this complex group of plants is not valid under modern rules of nomenclature. Four more or less differing Forms have been distinguished under the typical variety, but there is some overlapping and they are too vague to be given varietal rank. Var.  $\beta$  is retained with some doubt.

Plants sometimes produce a long thick fleshy leafless stem, especially when growing in rock crevices or otherwise struggling towards the light. The leaflets are very variable in length and shape, even in the same colony. The glandular indument which has hitherto distinguished *O. glandulosa* Jacq. (Form D.), has been found to occur in varying degrees in some of the yellow-flowered forms with rotund leaflets (Form C.). My specimens S. 6668 (Form D.) have the purple-mottled leaflets of var. *fuscata* and, except for their glandular hairs, resemble the typical *O. ambigua* very closely.

The majority of the specimens in the yellow-flowered set S. 2529 (Form B.) have narrow-oblong leaflets, but others begin to merge into Form A. It is possible that there is here a distinct variety which has hybridised with the more normal form.

Form C., with yellow flowers greatly resembles the Clanwilliam and Van Rhyn's Dorp forms of *O. luteola* Jacq., which also have minutely nigro-punctate leaflets and may be intermediates. The leaves, however, are more numerous and not glaucous on the upper side.

Var.  $\beta$  is, in its extreme forms, a very different looking plant, but some specimens approach the typical Form A. Although a number of colonies have been examined, no trace has been found of the remarkable *strumae* shown on the styles of *O. strumosa* Jacq. tab. 64. It is perhaps merely a coincidence that a number of vermilion insect pupae of almost exactly the same size and shape were found, though not symmetrically placed, in the flowers of the set S. 6656, for if Jacquin's model was grown from a bulb at Vienna, it is difficult to believe that similar living forms could have occurred there.

*O. strumosa* Jacq., var. *brevipes* L. Bolus was found to produce normal peduncles in cultivation.

41. *O. rhomboidea* Salter, Journ. of S.A. Bot. III (1937) 98. Small, erect, caulescent or rarely stemless, 5—12 cm. high. *Bulb* oval or ovoid,

slightly attenuate at the base and apex, 1.5—2.5 cm. long : tunics hard, brown. *Rhizome* up to 5 cm. long. *Stem* 2.5 cm. long, glabrous, with a few small scales. *Leaves* 3—8, apically congested : petioles 2—4 cm. long, glabrous or sparsely pubescent : leaflets 3, very shortly petiolulate,

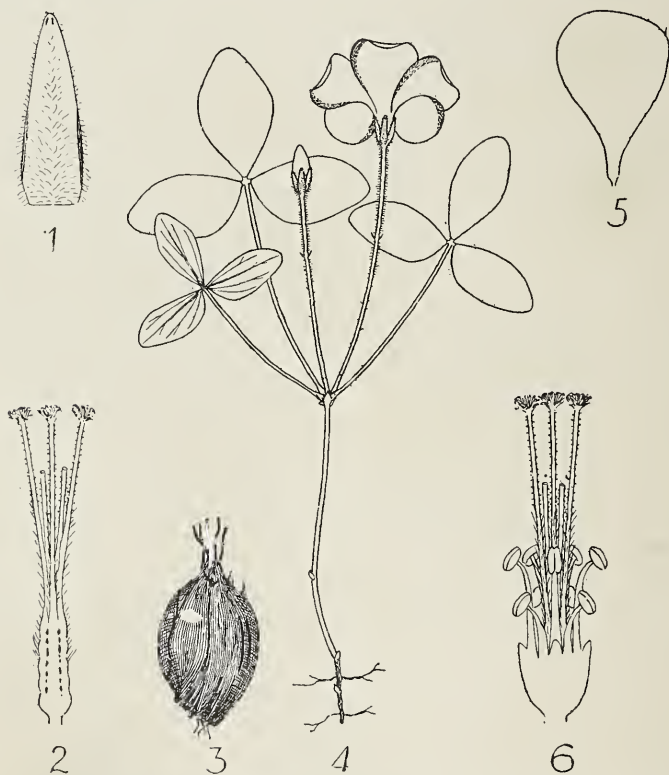


FIG. 14. *Oxalis rhomboidea*, Salter. 1. Sepal  $\times 6$ . 2. Gynaecium  $\times 6$ . 3. Bulb natural size. 4. Plant, natural size. 5. Petal  $\times 1\frac{1}{2}$ . 6. Androecium  $\times 6$ . (Salter 930.)

rhomboid-oval or rhomboid-ovate, obtuse, the lateral oblique, 1—2 cm. long, 0.6—1.1 cm. broad, glabrous or sparsely villose, digitately veined, sometimes nigro-punctate, dark green above, purple beneath, brownish-green on both faces when dried. *Peduncles* 1-fl., usually about as long as the leaves, pubescent particularly on the upper half, with 2 minute opposite bracts, orange-callose at the apex, set at an upper articulation



a little above the middle. *Sepals* lanceolate, obtuse or subacute, more or less pubescent, rarely glabrous, 3.5—5 mm. long, sometimes with 2 minute apical calli. *Corolla* 1.3—1.9 cm. long, yellow, with a broadly funnel-shaped concolorous tube: laminae of the petals broadly cuneate-obovate, up to 1 cm. broad, often purple-striate on the outer margin, attenuate to a short claw. *Filaments*, the shorter 2.5—4 mm., the longer 4.5—7.5 mm. long, glabrous or minutely glandular-pilose, shortly and broadly toothed, the longest (or the styles) somewhat exserted from the corolla tube. *Ovary* oblong, 1.7—2.5 mm. long, pubescent on the upper half, dotted with small purple calli, the chambers 5-ovuled: styles pubescent below, glandular-pubescent above. (Fig. 14.)

V. RHYN'S DORP DIV.; hills near Bitterfontein, *S.* 930 (*type* in Bol. Herb.), near Nieuwerust, *S.* 3388. Fl. June—July.

✱ 42. *O. crispula* Sond. Fl. Cap. I (1860) 325.—Journ. of S.A. Bot. VII (1941) 154. Rather densely hairy with simple hairs, usually with an exserted stem. *Bulb* ovoid or ovoid-oblong, often 2—3 cm. long, the blackish gummy tunics pubescent with rufous hairs at the apex. *Stem* erect, stout, leafless, usually 2—4 cm. long, with 1 or 2 semiamplexicaul scales. *Leaves* fairly numerous, terminally congested, spreading, with hirsute petioles up to 3 cm. long: leaflets 3, sessile, cuneate-oblong, entire at the apex, conspicuously undulate at the margins, 1—1.5 cm. long, pilose on both faces, green or brown, often nigro-punctate. *Peduncles* terminal, 1-fl., 2—4 cm. long, hirsute, with 2 small opposite bracts at an upper articulation near the middle. *Sepals* lanceolate, 4.5—5.5 mm. long, hirsute, inconspicuously callose at the apex. *Corolla* 1.5—2 cm. long, glabrous, rather pale yellow, with a broadly funnel-shaped tube: petals 8—12 mm. broad, the obliquely obovate limb twice as long as the claw, with a broad band of minute purple dots and streaks along the outer margin beneath. *Filaments*, the longer 3.5—6.5 mm. long, minutely glandular-pilose, with short teeth. *Ovary* pubescent and callose on the upper half, the chambers about 9-ovuled: styles pubescent below, glandular-pilose above. (Fig. 15.)

V. RHYN'S DORP DIV.; between Bitterfontein and Eenkoker, *Zey.* 230 *type*; Bitterfontein, *S.* 932A. Fl. May—June.

There are two distinct forms which grow in association, some plants having green leaves and others brown. These have retained their distinctive leaf colours in cultivation.

✱ Var. *β glandulosa* Salter, Journ. of S.A. Bot. VII (1941) 155. *Leaves* brown: leaflets thinly pubescent above, glabrous beneath, ciliate with capitate hairs, densely clothed with capitate hairs on all the other herbaceous parts.

V. RHYN'S DORP DIV.; Bitterfontein, *S.* 932B (*type* in Bol. Herb.)



*O. crispula* is closely related to some forms of *O. ambigua* Jacq. It bears a remarkable resemblance to *O. stenoptera* Turcz., var. *undulata*

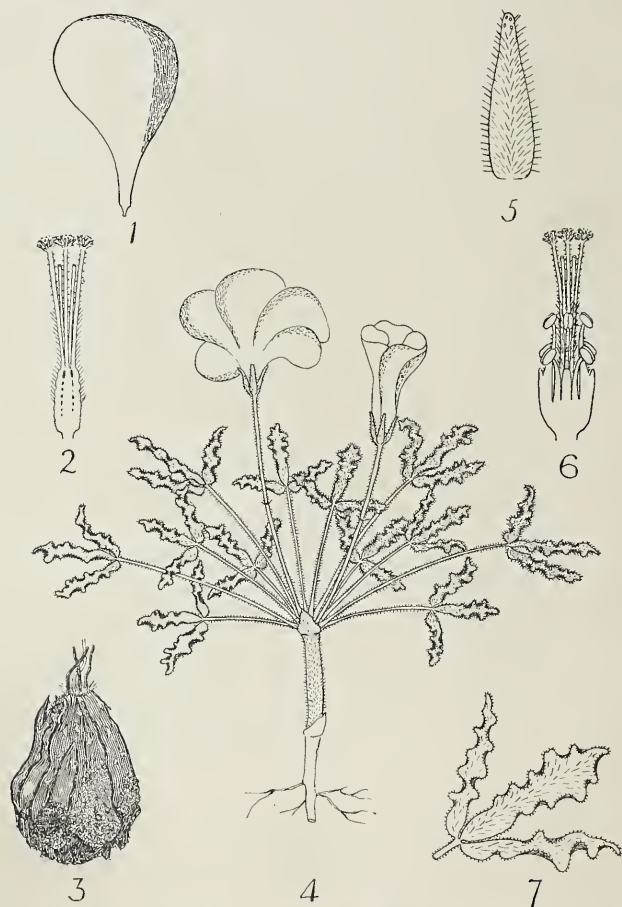


FIG. 15. *Oxalis crispula* Sond. 1. Petal  $\times 1\frac{1}{2}$ . 2. Gynaecium  $\times 6$ . 3. Bulb, natural size. 4. Plant, natural size. 5. Sepal  $\times 5$ . 6. Androecium  $\times 6$ . 7. Leaf of *O. crispula* var. *glandulosa* Salter  $\times 2$ . (Salter 932 A.)

Salter, as exemplified by Schltr. 8197, Karee Berg, which has been wrongly cited here in Pflrch-Ox.

For notes on this species see Journ. of S.A. Bot. loc. cit.

43. *O. luteola* Jacq. Oxal. (1794) 103, t. 65.—*O. luteola* Jacq., var. *marginata* Sond.—*O. fallax* Jacq.—*O. macrogony* Jacq.—*O. balsamifera* E. Mey. ex Sond.—*O. pulchella* Jacq., var. *glabrata* Sond. Stemless, 5—8 cm. high. *Bulb* more or less ovoid, acute, usually 2—3 cm. long: tunics dark brown, gummy. *Rhizome* 5—15 cm. long, with submembranaceous semiamplexicaul scales. *Leaves* few or many: petioles usually 2—4 cm. long, densely or sparsely villosa-pubescent or glabrescent: leaflets 3, cuneate-rotund or cuneate-obovate, usually emarginate, sometimes attenuate at the base, the medial 0·6—1·1 cm. long, 0·7—1·3 cm. broad, the lateral oblique, a little smaller, glabrous or pubescent above and beneath, often very narrowly cartilaginous-margined, usually ciliate sometimes with both patent and introrse hairs, rather conspicuously veined, often purplish, and in some specimens minutely nigropunctate beneath. *Peduncles* 1-fl., up to 8 cm. long, villose, with 2 minute filiform bracts at an articulation slightly above the middle. *Sepals* broadly lanceolate or oblong-lanceolate, usually obtuse, 4—6 mm. long, often with 2 small apical calli. *Corolla* 1·6—3·3 cm. long, yellow, with a rather narrowly funnel-shaped tube: laminae of the petals very broadly cuneate-obovate, subtruncate, rather longer than the narrow claw. *Filaments*, the shorter 2—3·5 mm., the longer 3·5—6·5 mm. long, glabrous or minutely glandular-pilose, with long acute teeth. *Ovary* glabrous or sparsely pubescent and with small orange calli on the upper part, the chambers 8—9-ovuled: styles densely glandular-pilose. Seeds endospermous. Plants occur rarely with double flowers.

RIVERSDALE DIV.; Albertinia, *Muir* 950: CALEDON DIV.; S. 607, 1142, 1182: BREDASDORP DIV.; *Schltr.* 7681, 10586, *Galpin* 4949, *Guthrie* 2037: CAPE DIV.; *Marl.* 7412, S. 565, 3441, 8747: CAPE PENIN.; E. & Z. 716 ex pte. (*O. fallax*), 717, 718, 709 (*O. rigidula*), S. 244/6, 617, 1001, 1176, 2403, 5419, 8065, 8102, 8152, *Bolus* 7102, *W-Dod* 63, 1154, 2653, *Marl.* 575, 8666, *Schltr.* 683, *B.H.* 14535, 14544, 14570, 14992: PAARL DIV.; S. 6006, 6020: MALMESB. DIV.; *Bachmann* 1075, 1076, 1086, *Guthrie* 2330, *B.H.* 14565, *S.A.M.* 48368, *Pillans* 6687, S. 653, 772, 2410, 6154: TULBAGH DIV.; *Marl.* 9081: PIQBG. DIV.; Pietersfontein, *Drège* (*O. balsamifera* E. Mey. ex Sond.) *Drège*, Langvallei (*O. pulchella* Jacq., var. *glabrata* Sond.), *Schltr.* 7914: CLANW. DIV.; *Edwards* 225, 232, 233, *Schltr.* 7931, 8030, *B.H.* 14612, 19663, S. 2134, 3327, 3518, 4431, 4434, 7248, 7579: V.R.'s DORP. DIV.; *Zey.* 241 ex pte. Fl. May—July.

The gummy adnate bulb tunics by which Sonder distinguished the species *O. balsamifera*, do not constitute a specific difference, being rather a matter of the age of the bulb. In the younger bulbs, which are always viscous, the outer tunics are sometimes soft and separable

after drying, but the mature bulbs become very hard and are usually coated with adhering particles of sand. The bulb in the *type* (Drège, Pietersfontein) in Herb. Sond. is by no means large for this species. In the plants from the more northern areas the leaflets are usually more glaucous above, more copiously nigro-punctate beneath and the bulbs are generally very large, but the transition is gradual and I can find no constant varietal difference.

The characters by which var. *marginata* Sond. has been distinguished, viz. the frequently larger petals with a purple external border, is of no varietal value.

✱ Var.  $\beta$  **minor** Salter, var. nov. *Planta nana*, 2—3 cm. alta. *Foliola* 1.5—4 mm. longa, 1.5—5 mm. lata, plus minusve nigro-punctata. *Corolla* 1.4—2.1 cm. longa.

PROB. DIV.; 5 miles south of "The Rest" (Grey's Pass), *S. 7235* (*type* in Bol. Herb.); Piquenier's Kloof (probably an error for the above locality\*) *Schltr. 7931*.

This consistently dwarf variety was growing luxuriantly and in great abundance in sandy arable land in the *type* locality and is evidently not a starved form. *Schltr. 7931*, distributed with the M.S. name of *O. minima* Sond., was not only attributed to that species by the author of Pfirch-Ox., but was obviously partly used in his description of that species. The bulb is entirely different.

44. **O. adenodes** Sond., Fl. Cap. I (1860) 334. (*A group species*).—*O. zonulata* L. Bolus.—*O. aureo-ciliata* Bolus f. = *O. ipomaeiflora* Schltr. ex R. Knuth.—*O. Pearsonii* Bolus f., non R. Knuth.—*O. mutabilis* Sond., var. *penicillata* R. Knuth.—*O. magnibulbosa* R. Knuth. Stemless, 3—8 cm. high, variously pilose. *Bulb*, when mature, subglobular, somewhat attenuate at the base and apex, often 2 cm. long, the younger narrow-oval, conspicuously attenuate or subfusiform: tunics hard, smooth, blackish-brown. *Leaves* few or up to 20: petioles terete, up to 4 cm. long, puberulous, pubescent or rarely hirsute, with simple or glandular hairs: leaflets very variable, the medial rotund, tapering more or less cuneately to the base, obovate, cuneate-obovate, obtuse, or cuneate-rhomboid, acute, the lateral rather smaller, oblique, glabrous, softly pubescent or villose and sometimes purple-zoned above, glabrous, distinctly veined and sometimes deep purple beneath, ciliate with simple, glandular or setose hyaline straw-coloured hairs or entirely naked on the margin. *Peduncles* 1-fl., usually very short, with indument as on

\*Several of Schlechter's *Oxalis* specimens between numbers 7928 and 7940, with the locality Piquenier's Kloof, were, as evidenced by my own field observation, probably collected on the plains to the south of this kloof, which is now known as Grey's Pass. His specimens were evidently not numbered in the exact sequence in which they were collected.

the petioles, with 2 opposite bracts at an articulation below the middle. *Sepals* ovate or ovate-lanceolate, acute or subobtusate, 4—8 mm. long, puberulous or sometimes subhirsute, ecallose. *Corolla* 1.5—4.5 cm. long, white, with a narrowly funnel-shaped pale yellow tube: laminae of the petals broadly cuneate, subtruncate at the apex, often purple-punctate on the outer margin, slightly longer than the narrow claw. *Filaments* usually glandular-pilose, the shorter 2.5—5 mm., the longer 4.5—8 mm. long, with long acute teeth. *Ovary* rather densely pubescent, sometimes only on the upper half, the chambers 5—8-ovuled: styles more or less pubescent, with some glandular hairs above. Seeds endospermous.

FORM A. (*typical*). Plant densely glandular-pilose or eglandular with simple hairs only. Medial leaflet rounded at the apex, cuneate at the base, 5—10 mm. long, 4—8 mm. broad, palish green, concolorous, prominently veined beneath, ciliate with capitate or with simple hairs.

*Glandular*. BUSHMANLAND; Lislap, *Zey.* (*O. adenoles* Sond.—*type*): NAMAQUALAND; Kamieskroon area, *S.* 1544 (cult.), 5511B; Concordia area, *S.* 4582B; Leliefontein-area, 6679. Fl. June—July.

*Eglandular*. Kamieskroon area, *S.* 5511A, Concordia area, 4582A, 5535, Springbok area, 892, 901, 2580.

The glandular and eglandular forms are similar in all other respects and grow either in association or in separate colonies. A few glandular hairs rarely occur in Forms B and D. Some specimens of *S.* 5535 show slight signs of the setose leaf-ciliation of Form C. *S.* 5511 A and B and 6679 have more narrowly cuneate leaflets and seem to merge into Form E.

FORM B. Plant not glandular. Leaflets wider in proportion, often larger (up to 1.9 cm. long), purple beneath, dark green, glabrous or sparsely pubescent and often purple-zoned above.

NAMAQUALAND; near Bowiesdorp, *L. Bolus* (B.H. 19129, *O. zonulata* L. Bolus), *S.* 848, 901B, 924, 1471, 2567, 3710 (cult.), 4602, 5564.

*S.* 848 is exactly the same as B.H. 19129 (*O. zonulata*) in which the leaflets are small and the bulbs smaller and more globular in shape. Others of the above merge into those specimens under Form C that are without setose ciliation on the leaflets.

FORM C. Plant not glandular. Leaflets usually densely ciliate with short ascending hyaline straw-coloured setae,\* densely purple beneath, larger than in the typical Form A.

NAMAQUALAND; Steinkopf, *M. Schlechter* 73 (*O. aureo-ciliata* Bolus f. = *O. ipomaeiflora* Schltr. R. Knuth), *S.* 2587 A and B.

In both sets of Schlechter's specimens which I have seen there are

\*Similar setae occur on the leaflets of *O. Eckloniana* Presl. var. *Sonderi* Salter, Form B.



some plants with entirely eciliate leaflets. In the set *S.* 2587 specimens with and without setae are equally divided. The petioles are not flattened as described in Pflrch-Ox.

FORM D. Plant not glandular. Leaflets rather pale green, concolorous, glabrous or adpresso-pubescent above, *always* setociliate; variable in shape and size, the medial broadly obovate or cuneate-obovate, obtuse or more often cuneate-rhomboid or elliptic-rhomboid, acute at the apex, 1—3.5 cm. long, 0.6—2.7 cm. broad. Petioles subhirsute.

NAMAQUALAND; Kamieskroon area, *S.* 805, 853, 2562, 5512, 5570; Garies area *S.* 6673.

*S.* 5512 has very large flowers and sharply acute sepals. Some specimens of *S.* 805 seem to merge into Form E.

FORM E. Plant densely villose or hirsute. Leaflets without setose ciliation, the medial obovate, cuneate-obovate or cuneate-rhomboid, up to 1.1 cm. long, 6 mm. broad.

NAMAQUALAND; Khamiesberg, *Pearson* (P. Sl. Mem. Ex. 6549, 6538, *O. Pearsonii* Bolus f., non R. Knuth), *Zey.* 2128\* (*O. mutabilis* Sond. var. *penicillata* R. Knuth), *S.* 804A; CALVINIA DIV.; Hantam-Gebirge *Meyer* an. 1869 (*O. magnibulbosa* R. Knuth).

A group or chain of interrelated micro-varieties and local forms. Although certain of these forms have been described as different species on the evidence of single collectings, a close scrutiny of the intermediate material which I have observed, convinces me that no definite dividing line can be found for their separation into species or even named varieties. The specimens are cited under five main Forms, A, B, C, D, and E, but it must be admitted that there is no hard and fast line between them.

45. *O. incarnata* L. Sp. Pl. I (1753) 433. (Jacq. tab. 71). Erect, caulescent, branching, 10—30 cm. high, glabrous or very sparsely pubescent on the younger parts. *Bulb* ovoid or narrow-ovoid, up to 2 cm. long, with a short curved beak, the outer tunics minutely puberulous, palish brown: bulbils forming both on the rhizome and in the leaf axils, the latter up to 1 cm. long. *Rhizome* long, slender. *Stem* slender, branching from the leaf axils, the internodes 1—7 cm. long. *Leaves* mostly in pseudo-whorls of 4—10, the lower sometimes opposite: petioles slender, 2—6 cm. long, dilated below the articulation: leaflets 3, shortly petiolulate, broadly or very broadly obcordate, tapering cuneately to the base, 0.5—1.5 cm. long, 0.8—2 cm. broad, thin, often livid beneath, folding downwards at night. *Peduncles* 1-fl., terminal or in the upper leaf axils, 3—7 cm. long, with 2 opposite callose bracts at an articulation above the middle. *Sepals* oblong, subacute, 4—6 mm. long, with several converging

\*Zeyher's number, 2128, in his south coast series of numbers, is inexplicable for a Namaqualand plant.



light brown calli near the apex. *Corolla* 1·2—2 cm. long, white or very pale lilac, with a rather broad pale greenish tube : petals obliquely subcuneate, slightly attenuate into a claw, minutely papillate at the base, rounded or somewhat truncate at the apex. *Filaments*, the longer 4—6·5 mm. long, pubescent, with conspicuous swollen obtuse teeth. *Ovary* pubescent on the upper half, the chambers 1-ovuled : styles pubescent, with small green stigmas. The short-styled form appears to be very rare, if existent at all. Seeds endospermous.

UITENHAGE DIV. ; *Long* 992 : HUMANSDORP DIV. ; *Galpin* 3842, *Thode* A 762 : KNYSNA DIV. ; *Bolus* 2280, *S.* 6952 : GEORGE DIV. ; *S.* 6914 : SWELLENDAM DIV. ; *Zey.* 2136 : CALEDON DIV. ; *Schltr.* 5953, *Galpin* 12674, *Pillans* 8517 : TULBAGH DIV. ; *Zey.* : CAPE PENIN. ; Newlands, *Bolus* 3382, *Zey.* 121b, *W. Dod* 1058, *Marl.* 2752, *S.* 244/11, 1305, 1911, 5234, 6167. A shade-loving species. Fl. Aug.—Sep., Jan.—Apl.

*Schltr.* 5085, cited in Plfreh-Ox. from Olifants Riv. Berge is *O. uliginosa* Schltr., perhaps through an erroneous label. This species does not occur in the Clanwilliam Div. *Schltr.* 9356, French Hoek, is a form of *O. heterophylla* D.C.

\*46. *O. duriuscula* Schltr., Eng. Bot Jahrb. XXIV (1898) 347. Erect, slender, up to 22 cm. high, with a long exserted stem. *Bulb* . . . : tunics acutely pointed and recurved at the apex, pale reddish brown, rather densely pubescent. *Rhizome* long, pubescent. *Stem* slender, wiry, brown, up to 19 cm. long, rarely bifurcate, glabrous, with 2 acute scales. *Leaves* usually 2—5, terminally congested : petioles filiform, 1·5—3 cm. long, glabrous : leaflets 3, linear, tapering at the apex, entire, conduplicate, 1—2·4 cm. long, 2 mm. broad, entirely glabrous or very sparsely pubescent beneath, copiously punctate with small reddish calli. *Peduncles* 1-fl., terminal, filiform, 2—3 cm. long, glabrous, with 2 subulate opposite bracts at an articulation on the upper half. *Sepals* narrow-ovate or lanceolate, acute, 4—5 mm. long, usually purple-margined, with 2—4 elongate reddish apical calli. *Corolla* up to 1·5 cm. long, glandular, rosy purple, with a funnel-shaped yellow tube : laminae of the petals obliquely obovate, obliquely truncate, rather longer than the narrow-cuneate claw, with a narrow purple outer margin beneath. *Filaments*, the longer 3—4·5 mm. long, thinly pubescent, gibbose : anthers 0·4 mm. long. *Ovary* glabrous or sparsely pubescent on the upper half, with conspicuous elongate red calli ; the chambers 1-ovuled : styles pubescent. *Capsule* shorter than the calyx. Seeds endospermous.

CALEDON DIV. ; Caledon, *Schltr.* 7599 (type—Berlin), *S.A.M.* 45931, *S.* 7221 : BREDASDORP, *L. Bolus* (B.H. 20435). Fl. May.

Often growing in tufts of Restionaceae. Like the following species an affinity of *O. heterophylla* D.C.

47. *O. pendulifolia* Salter, Journ. of S.A. Bot. V (1939) 67. Erect, caulescent, up to 30 cm. high. *Bulb* lanceolate in outline, about 4 cm. long, sharply acute or beaked at the apex, with a contractile root:

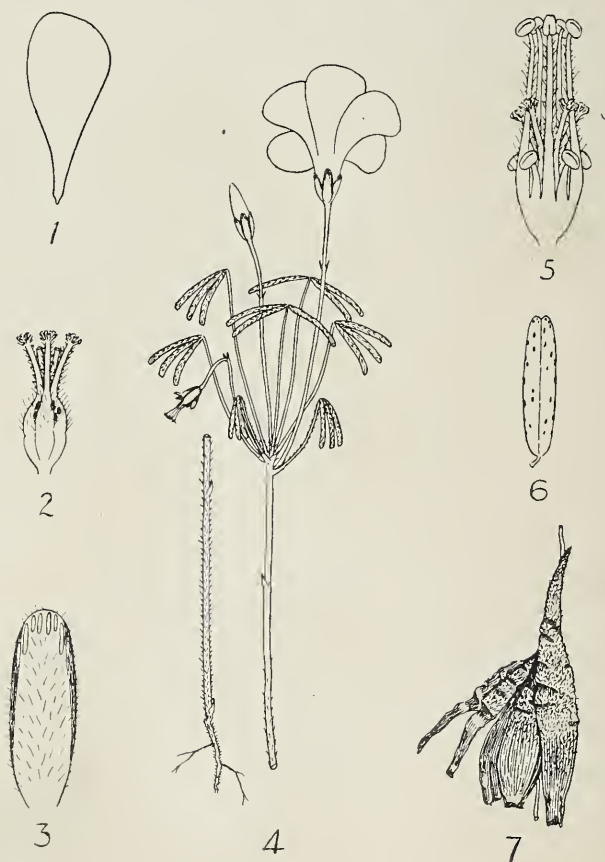


FIG. 16. *Oxalis pendulifolia*, Salter. 1. Petal  $\times 1\frac{1}{2}$ . 2. Gynoecium  $\times 5$ . 3. Sepal  $\times 6$ . 4. Plant, natural size. 5. Androecium  $\times 5$ . 6. Leaflet, upper side  $\times 2$ . 7. Bulb tunics after the new bulb has been drawn down by the contractile root, natural size.

tunics thin, rather pale brown, undulate, woolly, particularly on the upper part. *Rhizome* long, pubescent. *Stem* rigid, usually green, pubescent on the lower part, with a few scales, sometimes with short branchlets or a

few leaves. *Leaves* 6—12, apically congested : petioles filiform, ascending, sparsely pubescent, 2—3 cm. long : leaflets 3, more or less pendulous, shortly petiolulate, linear or oblong, or rarely obcordate, minutely incised at the apex, conduplicate, slightly falcate, glabrous above, sparsely pubescent beneath, 1—1.5 cm. long, with numerous orange (black when dry) callose dots. *Peduncles* 1-flid., apical, or sometimes one arising from an upper cauline scale, 3—4 cm. long, glabrous or sparsely villose, with 2 opposite subulate callose bracts at the upper articulation. *Sepals* oblong, obtuse, unequal, 4—6 mm. long, purple-margined, sparsely pubescent, ciliate, with 6—10 linear orange apical calli. *Corolla* glandular-viscid, up to 2 cm. long, brick-red, with a greenish tube : petals subcuneate, attenuate at the base, obliquely rotundate at the apex. *Filaments*, the longer 6.5—7 mm. long, clothed with both simple and glandular hairs, edentate. *Ovary* pubescent, with red calli on the upper half, the chambers 2—3 ovuled : styles with both simple and capitate hairs. (Fig. 16).

GEORGE DIV. ; George, *Schltr.* 2294 (type in Bol. Herb.), Montagu Pass, S. 3164 : SWELLENDAM DIV. ; Zuurbraak, Thode A 2303, Smith 2737 : KNYSNA DIV. ; Belvedere, Duthie 780, Plettenberg (?) Bay, Mundy, near Woodville S. 6919. Fl. Feb.—March. *George Div.*

*Schltr.* 2294 and Mundy's specimens are cited in Pflrch-Ox. under *O. punctulata* R. Knuth, but they are not the same as Bachmann 87, the type of that species, which is merely a form of *O. versicolor* L.

*O. pendulifolia* and the foregoing species, although they have not bifurcate leaflets, are affinities of *O. heterophylla* D.C. in the following Sub-section.

#### SUB-SECT. (ii). BIFURCATAE.

Leaflets bifurcate to about the middle or beyond.\* Plant usually caulescent. (Sp. 48—55.)

A natural group, with the possible exception of *O. Smithiana* E. & Z., a species of doubtful affinity.

Note.—*O. densa* N.E.Br. and *O. furcillata* Salter, placed after Section G (Foveolatae), where they are more nearly related, also have bifurcate leaflets, but not the opposite bracts of this Section.

48. *O. heterophylla* D.C., Prod. I (1824) 694. (*Group-species*).—*O. caledonica* Sond.—*O. heterophylla* D.C., var. *procumbens* Sond.—*O. anemonoides* E. & Z.—*O. Lightfootii* Phillips.—*O. Petheri* Zahlb.—*O. lanuginosa* R. Knuth. Erect or procumbent, usually caulescent, 5—25 cm. high. *Bulb* ovoid, more or less attenuate at the apex : tunics lanate.

\*Further study of the form of the juvenile leaflet, which is sometimes obcordate, is very much required in this sub-section.

*Rhizome* up to 30 cm. long or longer, very slender towards the base, sometimes lanate or pilose on the upper part, with a few small scales: plant rarely bearing aerial bulbils. *Stem* sometimes short, covered from the base with closely imbricate petiolate leaves, or elongate, subligneous, simple or branched, often very shortly, nude or leafy, glabrous or variously pilose, often with a few lanceolate scales. *Leaves* on the stem or branches usually subsessile or more rarely petiolate, the upper closely imbricating in a cluster towards the apex of the stem or branches, always petiolate: petioles pilose, generally 1—4 cm. long, or in shade forms longer: leaflets 3, shortly petiolulate, more or less obdeltoid in outline, usually 0·5—1 cm. long, from densely silky-pubescent to almost glabrous beneath, bilobed to about the middle or well beyond, sometimes broader than long, the lobes obtuse, widely diverging, rarely with a few indistinct calli. *Peduncles* apical on the stem or branches, 1·5—5 cm. long, rarely longer, pilose, often with glandular hairs admixed: bracts 2, linear, opposite, at an articulation above the middle. *Sepals* varying from oval, 3—4 mm. long to lanceolate, up to 7 mm. long, densely cano-pubescent or shortly glandular-pilose, purple-margined, with 2—4 apical calli or frequently ecallose. *Corolla* 1·5—2 cm. long, red or more rarely rose, pubescent or glandular-pubescent, with a fairly wide funnel-shaped yellow tube, shorter than the limb: petals broadly cuneate, slightly attenuate below, 0·9—1 cm. broad, rounded, abruptly truncate, retuse or lightly incised at the apex, with a darker reddish-purple outer margin beneath. *Filaments* pubescent, often with glandular hairs admixed, the longer up to 7 mm. long, shortly and rather obtusely toothed. *Ovary* oblong, about 2 mm. long, densely pubescent nearly to the base, sparsely pubescent about the apex or even completely glabrous, with conspicuous calli, varying from a single row around the apex to a succession of vertical rows reaching nearly to the base: styles hispid, sometimes with short glandular hairs admixed. Seeds endospermous.

NAMAQUALAND; Khamiesberg, *P. Sl. Mem. Ex.* 6679: V.R.'s DORP Div.; Gift Berg, *P. Sl. Mem. Ex.* 7601 (*O. Lightfootii* Phillips), 7474, 7477; V.R.'s Pass, *S.* 1612, *Barker* 1076: CLANW. Div.; *B.H.* 20380, 20381, 20382, 20383, 20384, 20385, *Pillans* 9043, *S.* 7009, *S.A.M.* 52616: PIQBG. Div.; *Schltr.* 5267 (erroneously cited as *O. comosa* in Pfrch-Ox.), *B.H.* 20193, *Pillans* 7362: MALMESB. Div.; Kranzfontein, *Penther* 2245 (*O. Pentheri* Zahlbr.): CERES Div.; *Schltr.* 8921, *S.* 6402, 6403, *B.H.* 21814, 22657: TULBACH Div.; *Phillips* 1836, *S.A.M.* 50393, 51263: PAARL Div.; French Hoek, *Schltr.* 9356 (erroneously cited as *O. incarnata* in Pfrch-Ox.): WORCES. Div.; *Mitchell* 304, *B.H.* 21661: LAINGSBURG Div.; *Compton* 3764, 4005, 7830, *Marl.* 10803 (with aerial bulbils): SUTHERLAND Div., *Marl.* 9685: LADI-



SMITH DIV.; *Compton* 3880; P. ALBERT DIV.; *B.H.* 20379, 21726; CALEDON DIV.; *E. & Z.* 666 (*O. anemonoides* E. & Z.), 667, 668 (*O. bifurca*), *Zey.* 2133 (*O. caledonica* Sond.), *Bolus* 6776, *Marl.* 9208, *Lamb* 1756, *B.H.* 14785, 20024, 20376, 20378, *S.* 2014, 4873, 4789, 6179, 6187; BREDASDORP DIV.; *S.* 4860; SWELLENDAM DIV.; *Galpin* 3841; RIVERSDALE DIV.; *Muir* 2713, *S.A.M.* 38988. Fl. Aug.—Oct.

FORM B. *Leaflets* pale green, usually densely silky with simple hairs. *Sepals* lanceolate, acute. Plant often almost stemless.

CERES DIV.; *Schltr.* 8921, *Marl.* 3320, 6168, *S.* 2109, 2636, *Leipoldt* (B.H. 21516), *Compton* 6390. Fl. Oct.

This form is somewhat intermediate with *O. lanata* L.f., var. *rosea* Salter, which is a close affinity. The leaflets of the bulbils are obcordate.

FORM C. *Leaflets* with greenish-yellow hairs on the upper face (when dried).

Loc. unknown *Schltr.* (Berlin) *O. lanuginosa* R. Knuth.

Only known to me from dried specimens. It is certainly not a separate species.

A polymorphous group of plants, distinguishable in the sub-section Bifurcatae by their lanate bulb-tunics. The short, rather obtuse teeth on the longer filaments and the presence of calli on the ovary, though in varying numbers, also seem to be constant characters. The varying characters in almost every part of the plant, as enumerated in the description, are combined in many different ways and although, at first sight, some forms appear to stand out distinctly, intermediates are always to be found. It is particularly prone to epharmonic variation and many of the mountain forms are almost stemless or produce leafless stems. Except in Form B, in which the juvenile leaflets are obcordate, nothing is known of the early leaf stage.

For a species so widely distributed it has not been very largely collected or studied in the field and it is probable that only a fraction of the possible combinations has as yet come to light. The bulbs lie very deep and are rarely collected.

Note.—*O. stenodactyla* Turcz., cited as a synonym by Sonder in *Corrigenda*, Flor. Cap. I, p. 20, is *O. variifolia* Steud. (*O. heterophylla* E. & Z., non D.C.).

\* 49. *O. extensa* Salter, sp. nov. *Planta* parva, sparse villosa, 4—7 cm. alta, caule breviter exserto. *Bulbus* ovoideo-conicus, tunicis tenuibus glabris, pallide rubro-brunneis. *Caulis* ad 2 cm. longus. *Folia* caulis apicem versus imbricata, petiolis ad 2 cm. longis: foliola 3, ad medium bilobata, conduplicativa, saepe 0.6 cm. longa, 1 cm. lata, basin versus cuneato-attenuata, lobis obtusis divergentibus, nervo medio falcato, ecallosa. *Sepala* oblongo-lanceolata, ecallosa. *Pedunculi* uniflori, bracteis



2, oppositis. *Corolla* 1·5—1·7 cm. longa, rosea, tubo luteo. *Filamenta* longiora edentata.

Small, with a short stem, sparsely villose, 4—7 cm. high. *Bulb* ovoid-conical, acute at the apex, 2·5—3·5 cm. long: tunics glabrous, thin, papery, rather pale reddish-brown, the outer splitting and plicate at the base. *Rhizome* long, stout for the size of the plant. *Stem* 1—2 cm. long, glabrous, usually with several scales on the lower part. *Leaves* rather numerous, more or less imbricate on the upper part of the stem: petioles up to 2 cm. long, often shorter, the lowest scarcely projecting above the basal articulation: leaflets 3, sessile, bilobed to about the middle, often 0·6 cm. long, 1 cm. broad, ecallose, rather thick, impresso-punctate when dry, conduplicate, the medial nerve falcate, the lobes obtuse, diverging. *Peduncles* many, 1-flid., 2—4 cm. long, with 2 opposite subulate bracts on the upper part. *Sepals* oblong-lanceolate or oblong, subobtuse, about 6 mm. long, sparsely ciliate, ecallose. *Corolla* 1·5—1·7 cm. long, glabrous, rosy, with a funnel-shaped yellow tube: petals subcuneate, 7—8 mm. broad, slightly attenuate to the base. *Filaments* minutely glandular-pilose, the shorter 1·3—3·5 mm., the longer 3·5—5·5 mm. long, edentate or slightly gibbose. *Ovary* glandular-pilose on the upper half, the chambers 1-ovuled: styles with simple and capitate hairs admixed. Seeds with thin endosperm, the embryo green.

KENHARDT Div.; on kopjes on the north bank of the Orange River, Rooipad, near Augrabies Falls, *Leipoldt* (B.H. 21730, *type* in Bol. Herb.). Fl. Mch.

50. *O. bifurca* Lodd. Bot. Cab. (1825) t. 1056.—*O. bifurca* L.B. Cab., var. *latiloba* Sond. Erect, caulescent, fairly robust, 15—30 cm. high, silky-pubescent, sometimes with glandular hairs admixed. *Bulb* conical or ovoid-conical, 4—6 cm. long, with dark brown glabrous tunics: root contractile. *Rhizome* robust, with rather large amplexicaul cuspidate scales. *Stem* often 2 mm. in diam., sometimes shortly branched, subsilky or hirsute, densely leafy or almost naked. *Leaves* numerous, both cauline, or tufted on short branchlets, and terminal, or nearly all terminally clustered: lower cauline petioles short, the upper and terminal 2—5 cm. long: leaflets 3, subsessile, bifurcate to the middle or beyond, narrowly cuneate-attenuate at the base, with divergent oblong obtuse lobes 2—3 mm. broad, glabrous above, silky-pubescent beneath, ciliate or more rarely glandular-ciliate, obscurely dotted all over with faint reddish-brown streaks which darken in drying. *Peduncles* 1-flid., axillary on the upper part of the stem, often 3—4 cm. long, with 2 opposite bracts at an articulation above the middle. *Sepals* lanceolate, 4—6 mm. long, often silky-pubescent, with several elongate calli towards the apex. *Corolla* 1·8—2·5 cm. long, pubescent, rosy purple or white, with

a broadly funnel-shaped yellow tube: petals obliquely subcuneate, slightly attenuate towards the base, obliquely subtruncate at the apex, 1—1.5 cm. broad. *Filaments*, the longest 5.5 mm. long, pubescent on the upper part, edentate or with short teeth. *Ovary* oblong, 2 mm. long, glandular-pilose on the upper half, with elongate apical calli, the chambers 2—4-ovuled. Seeds endospermous.

TEMBULAND; Unguali, *Bolus* 8818, Engcabo, *Flanagan* 2810: TRANSKEI; Kentani, *Pegler* 695: Mt. Boschberg, *MacO* 1869: ALBANY DIV.: *Schönland* 3149. Fl. Jan.

*Drège* 5251 from Piquetberg, previously cited here, is *O. ebracteata* Savign. Possibly Sonder was the victim of interchanged tickets. I have not seen *Drège's* specimens from between Gekau and Basche and near Omsamculo.

Var. *β angustiloba* Sond.—*O. bifurca* L.B. Cab., var. *incana* Sond.—*O. incana* E. & Z.—*O. argentea* E. & Z., non R. Knuth.—*O. Brehmiana* E. & Z. *Leaflets* with the lobes narrower, often involute and frequently more densely silky pubescent. *Sepals* with smaller, inconspicuous calli, or ecallose. *Corolla* rosy-purple or white.

UITENHAGE DIV.; E. & Z. 669 (*O. incana* E. & Z.), E. & Z. 670 (*O. argentea* E. & Z.), *Galpin* 9921, *Paterson* 3364: ALEXANDRIA DIV.; *Galpin* 10801: BATHURST DIV.; *Marl.* 8565: ALBANY DIV.; E. & Z. 671 (*O. Brehmiana* E. & Z.), *Zey.* 2134, *Rogers* 27700, *Schltr.* 2602, *Rennie* 478, *Holland* 320, 4124 (cult), *MacO.* 892, *S.* 4375 (cult): E. LONDON; *Ratray* 1385, *Flanagan* 2326, *Galpin* 3244: QUEENSTOWN; *B.H.* 22234, *Galpin* 1792, *Potts* 1866: TEMBULAND; Cala, *Pegler* 1641: ALBERT DIV.; Burghersdorp, *Guthrie* 41B: GRAAF REINET; *Drège* 86 (*O. dissecta* E. Mey. M.S.), *Bolus* 756: HUMANSDORP DIV.; Quagga's Drift, *Tyson* 119. Fl. Jan.—Apl.

This species is founded on the illustration of a cultivated plant in Lodd. Bot. Cab. The typical form with wide leaflet-lobes has not been extensively collected and little is known of the extent of its variation. The variety *angustiloba* Sond. is only retained with the gravest doubt, for the line of demarcation is vague and some specimens tend to be intermediate. Var. *incana* Sond. certainly cannot be upheld as separable from this. The leaflets in this species are shaped somewhat like the letter Y.

51. *O. Tysoni* Phillips, *Annals of S. Af. Mus.* IX (1917) 338. Caulescent, 10—22 cm. high, thinly villose, with glandular hairs admixed. *Stem* erect, with a few ovate-lanceolate semialexical scales on the lower part, leafy above. *Leaves*, the lower cauline or clustered on abortive branchlets, with short petioles, the topmost terminally clustered, with petioles 1—2.5 cm. long: leaflets 3, sessile, 0.5—1 cm. long, bilobed to

rather below the middle, cuneate at the base with divergent lobes, pilose below, glabrous above, ciliate with glandular hairs: lobes obovate, up to 3 mm. broad, with several calli towards the apex. *Peduncles* 1-fl., axillary on the upper part of the stem, 2—3.5 cm. long, with 2 linear opposite bracts at an articulation a little above the middle. *Sepals* ovate or ovate-oblong, obtuse, 3.5—4 mm. long, with 2 conspicuous apical calli. *Corolla* up to 1.3 cm. long, ? white, pubescent. *Filaments* the shorter 1.5—3.5 mm., sparsely glandular, the longer 2—5 mm. long, densely pubescent. *Ovary* pilose near the apex: styles rather densely pubescent, with glandular hairs admixed. (The shape and colour of the corolla cannot be determined from the dried specimens seen).

GRIQUALAND EAST; Kokstad, 5100 ft., Dec. *Tyson* 1334 (type in S. Af. Mus.); Mt Currie, *Stephanie* 434, 498: TRANSKEI; Kentani, *Pegler* 695: QUEENSTOWN, *Gulpin* 1768, 8297. Fl. Oct.—Mch.

Perhaps a glandular form of *O. bifurca* Lodd. It is only known to me from dried specimens. The bulb has not been collected.

\* 52. *O. orthopoda* Salter.—*O. erecta* R. Knuth, non Savign. Erect, caulescent, up to 15 cm. high, clothed with fine simple and pluricellular hairs. *Bulb* narrow-ovoid, attenuate at the base, with a long acute apical beak, in all 2—3 cm. long: tunics hard, brown, glabrous, with narrow raised longitudinal ridges. *Rhizome* rather slender, glabrous. *Stem* 4—6 cm. long, densely leafy almost to the base. *Leaves* cauline: petioles filiform, the upper 1—2.5 cm. long, the lower progressively shorter and more conspicuously scale-like below the basal articulation, the lowest about 5 mm. long: leaflets 3, shortly petiolulate, triangular-obcordate in outline, bilobed almost to the middle, thin, glabrous above or villose on both faces, ecallose, the lobes obovate, obtuse. *Peduncles* 1-fl., erect, axillary, usually arising from the lower part of the stem, 5—11 cm. long, with 2 narrowly oblanceolate opposite pilose bracts, 3—5 mm. long, at an articulation above the middle. *Sepals* lanceolate, acute or subobtuse, 4—6 mm. long, ciliate, ecallose, sometimes with a narrow purple margin. *Corolla* 1.5—2 cm. long, rosy purple or white minutely glandular-pilose, with a rather widely funnel-shaped palish yellow tube: petals cuneate, 6—7 mm. broad, subtruncate at the apex, attenuate to a short somewhat oblique claw. *Filaments*, the shorter 3—4.5 mm., the longer 5—6.5 mm. long, glandular-pilose, edentate. *Ovary* glabrous, the chambers 4-ovuled: styles with simple and glandular hairs admixed.

RIVERSDALE DIV.; (rose-purple) *Rust* 523 (*O. erecta* R. Knuth, type—Berlin), 7 miles east of Riversdale, S. 2377: MOSSEL BAY DIV.; near Gouritz River Bridge, S. 2359: SWELLENDAM DIV.; near Heidelberg (white), S. 6794 (and cult.). Fl. June.

The name is changed on account of the earlier *O. erecta* Savign., Lam. Encl. IV (1797) 685. This species attains several years in age before flowering.

53. *O. comosa* E. Mey. ex Sond., Fl. Cap. I (1860) 340. Tall, shade-loving, caulescent, branching, 30—80 cm. high. *Bulb* clongate, ovoid or lanceolate in outline, produced at the apex into a long beak, in all 10—13 cm. long: tunics brown, shining, pilose with short setose and capitate hairs, conspicuously undulate, those of the beak narrow-lanceolate smooth, acute. *Rhizome* often 30 cm. long, with a few large scales on the upper part, clothed below with the persisting tunics of the old bulbs, through the action of the contractile root. *Stem* stout, often 3 mm. in diam. at the base, almost glabrous, with many alternate branches. *Leaves* numerous, terminally congested on the stem and branches and often some cauline: petioles 2—8 cm. long, glabrous or thinly pilose, dilated and squamiform below the articulation: leaflets 3, sessile, very broadly cuneate-obcordate, bilobed to about the middle, sometimes tapering attenuately to the base, up to 0.9 cm. long, 1.4 cm. broad, the lobes ovate-oblong, obtuse, glabrous or sometimes sparsely pilose beneath, often with 2 or more inconspicuous large brownish calli near the upper margin. *Peduncles* 1-fl., terminal, stout, often numerous, 3—4 cm. long, more or less pubescent on the upper part, deflexing at the bibracteate articulation towards the apex after flowering. *Sepals* broadly lanceolate, 7—9 mm. long, more or less pubescent, ciliate, rarely bicallose at the apex. *Corolla* 2—2.5 cm. long, pale rose, with a rather short broadly funnel-shaped yellow tube: petals broadly and obliquely cuneate, subtruncate, scarcely attenuate below. *Filaments*, the shorter 3—5.5 mm., the longer 5—8.5 mm. long, unequal, with long teeth. *Ovary* pubescent on the upper half, the chambers several-ovuled: styles pubescent, often glandular-pilose towards the apex. Seeds endospermous.

NAMAQUALAND; Uitkomst, *Drège* (type in Herb. Sond.) *Schltr.* 11152, *Marl.* 6746, *Bolus* 6652, *Pillans* (B.H. 20377), *Esterhuysen* 5447, *S.* 812, 832, 1480, 1548, 3706, 5515, *Barker* 1069. Fl. July—Sep.

*Schltr.* 5267, attributed here in Pflrch-Ox., is a form of *O. heterophylla* D.C.

Common in northern Namaqualand, especially in the hilly regions as far south as Kamieskroon. It is very variable in size, often growing to 2 ft. in shady places. Bulbs taken from such specimens have produced densely tufted, almost stemless plants when grown in cultivation in an open sunny position.

54. *O. bifida* Thunb., Diss. 18, No. 16, f. l. (Jacq. Oxal. tab. 74, f. 4).—*O. filicaulis* Jacq. Caulescent, with a weak erect or procumbent branching stem. *Bulb* ovoid, acute or sometimes beaked at the apex. 2.5—7 cm.



long : tunics papyraceous, reddish-brown, the outer sometimes glandular-pilose. *Stem* up to 30 cm. long, with several long alternate suberect branches arising in the axils of the stem scales. *Leaves* congested at the apices of the stem and branches : petioles slender, often 1.5—2.5 cm. long, glabrous or sparsely pilose : leaflets 3, petiolulate, cuneate-triangular, bifurcate to the middle or a little beyond, the medial often 5—6 mm. long and broad, the lateral a little smaller with unequal lobes, glabrous above, often sparsely pilose beneath, with elongate black calli dispersed along the margins, the lobes tapering, obtuse, 1 mm. broad. *Peduncles* 1-fl., 2.5—8 cm. long, pubescent above, with 2 small opposite callose bracts at an articulation above the middle. *Sepals* narrow-ovate, obtuse, 5 mm. long, pubescent, often purple-margined, with several elongate calli about the apex and upper margins. *Corolla* 1.5—2 cm. long, rosy, with a broadly funnel-shaped greenish tube : petals obliquely cuneate, rounded at the apex, scarcely attenuate into a claw, 6—10 mm. broad, pubescent and narrowly edged with purple on the outer margin beneath. *Filaments* pubescent, the shorter 2.5—4.5 mm., the longer 4.5—7 mm. long, obtusely toothed. *Ovary* pubescent near the apex, with elongate orange-red apical calli, the chambers 1—2 ovuled : styles pubescent with simple and glandular hairs. Seeds endospermous.

CAPE PENIN. ; *E. & Z.* 664, 665, *Bolus* 4875, *W-Dod* 1028, 2508, *Galpin* 4857, *Marl.* 435, *Pillans* 2468, *B.H.* 14502, *S.* 244/12, 568, 2065, 8077 : CAPE DIV. ; *S.* 558 : WELLINGTON DIV. ; *B.H.* 14516, 20189, *S.* 4347 : CALEDON DIV. ; *Bolus* 9160 : CERES DIV. ; *S.* 2101. Fl. March—July.

FORM B. Densely tufted. *Stem* short, woody, usually procumbent, with numerous short branches and branchlets. *Leaves* very numerous, often several hundreds, closely congested on the branchlets : petioles often 4—5 cm. long : leaflets 6—8 mm. long. *Peduncles* rather numerous, axillary, longer than the leaves.

CAPE PENIN. ; Wynberg Hill, *S.* 4870, *F. Bolus* (B.H. 21931), Camp's Bay, *S.* 7460. Fl. Aug.—Oct.

This species is a partial shade-lover. Early flowers sometimes appear before the development of the leaves. I have not seen Thunberg's type, but this is undoubtedly the plant figured in the Dissertation. Form B is strikingly different in habit and season of flowering, but since I suspect that it may be teratologic, I have refrained from giving it varietal rank.

55. *O. Smithiana* E. & Z. Enum. I (1836) 94, No. 739.—*O. Smithii* Sond., var. *latiloba* Sond. and var. *angustiloba* Sond.—*O. gracilicaulis* E. & Z.—*O. tristis* E. & Z.—*O. candida* E. & Z.—*O. nemorosa* E. & Z.—*O. Galpinii* Schltr. non Burrt Davy. Stemless, rather weak, 10—20



cm. high, sometimes heterophyllous, entirely glabrous or with a few weak, simple or glandular hairs. *Bulb* ovoid, acute at the apex, often about 2 cm. long: tunics few, rather thin, reddish-brown: root contractile. *Leaves* 2—20, but usually few, with slender petioles 5—18 cm. long: leaflets 3, polymorphous, sometimes heterophyllous on the same plant, very shortly petiolulate, bilobed to the middle or below, or even more frequently nearly to the base, varying from very broadly cuneate-obcordate or attenuate-obcordate to triangular in outline, commonly 1—4.5 cm. long, the sinus rounded or acute, the lobes sub-ovate, oblong, linear or narrow-linear, the narrow lobes forked, acute and much longer than the broad ones, often rather prominently veined, rarely undulate at the margins. *Peduncles* 1-fl., as long as or rather longer than the leaves, with 2 subulate opposite bracts at an articulation above the middle. *Sepals* lanceolate, with 2 orange-red apical calli. *Corolla* 1.7—2.5 cm. long, pale lilac or white, with a rather broadly funnel-shaped greenish tube: petals cuneate-obovate or subcuneate, sometimes more or less attenuate into a short claw below, rounded at the apex, 0.7—1.4 cm. broad. *Filaments* glandular-pilose, often with simple hairs admixed, the shorter 2.5—4.5 mm., the longer 4.5—6.5 mm. long, with prominent teeth. *Ovary* more or less glandular, the chambers about 8-ovuled: styles glandular-pilose. *Capsule* oblong, 1—1.5 cm. long, exserted beyond the calyx. Seeds endospermous.

GEORGE DIV.; *B.H.* 21932: BEAUFORT WEST DIV.; *B.H.* 20019: KNYSNA DIV.; *Williamson* 102: MIDDELBURG DIV.; *Bolus* 15177, *Guthrie* 4061: WILLOWMORE DIV.; *Zey.* 2139: HUMANSDORP DIV.; *Galpin* 3840, *Fourcade* 1137, *Britten* 1227: SOM. EAST DIV.; *Bolus* 436: UITENHAGE AND P. ELIZ. DIVS.; *Drège* 7434, 7438, *E. & Z.* 739 (type) 720 (*O. gracilicaulis* *E. & Z.*), 738 (*O. tristis* *E. & Z.*), 740 (*O. candida* *E. & Z.*), *Zey.* 2103, 2139, 2140, *Schltr.* 2545, *Galpin* 6400, *B.H.* 19781, *Holland* 3685, *Marl.* 9362, *Pillans* 6648, *Paterson* 469, *S.* 377/61: ALEXANDRIA DIV.; *Galpin* 10763: PORT ALFRED: Schönland 1543: ALBANY DIV.; *Daly* 813, 877: KING W's TOWN DIV.; *E. & Z.* 741 (*O. nemorosa* *E. & Z.*), *Leighton* (*S.* 2291, 4372), *Holland* 3988, *Dyer* 308, 1455, *S.A.M.* 49751, *S.* 5249: ALICE DIV.; *B.H.* 20006, 20007: E. LONDON DIV.; *Egan* 116/32, *Galpin* 3225, *B.H.* 16434: QUEENSTOWN; *Galpin* 1630 (*O. Galpinii* *Schltr.*), *B.H.* 16492: ALBERT DIV.; Burgersdorp; *Guthrie*, 31B, 49B: Aliwal North; *F. Bolus* 211: Komgha; *Flanagan* 200, 803: TRANSKEI; Kentani, *Pegler* 160, *B.H.* 20742: GRIQUALAND E.; *Britten* 4673: BASUTOLAND; *Page*, *Dieterlen* 540, 879: NATAL; *Galpin* 617, 675, *Mogg* 1460, *Medley-Wood* 4965, *B.H.* 20033, 20412, 21189: TRANSVAAL: Barberton, *Galpin* 675: ZULULAND: *Galpin* 12160. Fl. Jan.—Aug.

Certain heterophyllous specimens show that subdivision on the leaf characters, as attempted by Sonder, is quite unreliable, but the extent to which heterophylly occurs requires extended and careful field observation.

*O. Galpinii* Schltr., with rather small leaflets, is obviously a form of this.

#### Sect. E. STICTOPHYLLAE.

Leaflets broad (except in *O. purpurea* Form E (iii)), striolate or black-dotted when dry. Bracts alternate, below the middle of the peduncle. Seeds endospermous. (*Sp.* 56—58.)

56. *O. purpurea* L.\* *Sp. Pl.* I (1753) 433. (*A group-species*).—*O. variabilis* Jacq. and var. *rubra* Jacq.—*O. reptatrix* Jacq.—*O. suggillata* Jacq.—*O. grandiflora* Jacq.—*O. laxula* Jacq.—*O. rigidula* Jacq.—*O. humilis* Th.—*O. purpurea* Th., var. *humilis* (Th.) R. Knuth. (*Further synonymy given under the different Forms.*) Stemless, somewhat robust, more or less pubescent or subhirsute, up to 15 cm. high. *Bulb* ovoid or narrow-ovoid, acute or rarely beaked at the apex, 1.5—3 cm. long, with rigid gummy blackish-brown tunics: root contractile. *Leaves* few or many, often spreading or prostrate: petioles terete or more rarely slightly compressed, commonly 2—8 cm. long, pilose: leaflets 3, sessile, usually glabrous above, ciliate, sprinkled with numerous inconspicuous pellucid dots and streaks which turn black in drying, entirely green or sometimes glaucous and rarely purple-mottled above, more or less pilose and often deep purple beneath, the medial attenuate or tapering cuneately to the base, more or less broadly rotund in the upper part, more rarely subrhomboid or cuneate-rhomboid, becoming subacute or acute at the apex (rhomboid-oblong in Form E (iii)), often emarginate or lightly incised, 0.4—4 cm. long, 0.4—3 cm. broad, the lateral oblique, somewhat oblong-semicircular, with the interior margin straight or retuse, smaller and in some forms only half as long as the medial. *Peduncles* 1-fl., shorter or longer than the leaves, usually pilose, with 2 alternate linear bracts at or below the middle. *Sepals* more or less lanceolate, 0.5—1 cm. long, striate with longitudinal pellucid lines (darkening when dry), ciliate with simple hairs and usually with a few minute capitate hairs intermixed. *Corolla* 1—4 cm. long, rose-purple, deep rose, various shades of pale violet, salmon, yellow, cream-coloured or white, with a narrowly cyathiform yellowish tube: laminae of the petals broadly cuneate-obovate, often obliquely sub-

\*For reversion to the name *purpurea* L. in the place of *variabilis* Jacq., see *Journ. of S.A. Bot.* V (1939), 48.

truncate at the apex, longer than the obliquely attenuate claw. *Filaments* usually glandular-pilose, the longer conspicuously toothed. *Ovary* pubescent and callose on the upper part, the chambers many-ovuled: styles more or less pubescent, with glandular hairs on the upper half. *Capsule* shorter than the calyx. Seeds endospermous.

FORM A. Typical. *Corolla* rosy-purple, violaceous, white or rarely yellow.

V. R's DORP DIV.; S. 955, 7258, 7287; CLANW. DIV.; *Edwards* 219, 224, *B.H.* 14576, 14610, 19768, 19773, 22236, 22239, S. 737: CALVINIA DIV.; S. 4457: PIQBG. DIV.; *Guthrie* 2290, *Bolus* 6691, *Schltr.* 4900, 7901, 7905, *Pillans* 7492, S. 3424, 6143: WORCES. DIV.; *Bolus* 2735: MALMESB. DIV.; *Bolus* 4257, 9954, *B.H.* 14554, *Bachmann* 1064, 1111, 1112 (or 1864, 1911, 1912), *S.A.M.* 48362, 48372, 48373; *yellow* S. 2260, 3356, 8631: TULBAGH DIV.; S. 6088: WELLINGTON DIV.; *B.H.* 14518, *Thompson* 22: PAARL DIV.; *Phillips* 8272, *Marl.* 3753: CAPE DIV.; S. 1022: CAPE PENIN. E. & Z. 705 (*O. humilis*), 712 (*O. grandiflora*), *Zey.* 156, 233, 235 (ex pte.), 243, *Bolus* 3383, 3391, 4675, 9320, *MacO.* 1716, *W-Dod* 67, 68, 1081, *Marl.* 75, *B.H.* 14501, S. 510, 511, 535, 645, 8112, *Smith* 2852: CALEDON DIV.; *S.A.M.* 45927, S. 1143, 6213: BREDASDORP DIV.; S. 4810: SWELLENDAM DIV.; *Muir* 4999: RIVERSDALE DIV.; *Muir* 2585, *Galpin* 3837, S. 6773: HUMANSDORP DIV.; *Thode* A 761, *Galpin* 2591, 3843, *Fourcade* 1421. F. Apl.—Sep.

FORM B.—*O. speciosa* Jacq. *Medial leaflet* about as broad as long, purple below. *Corolla* deep rose or yellow.

*Corolla rose.* MALMESB. DIV.; *Zey.* 233, S. 1231, 2420: TULBAGH DIV.; S. 5406, 6092.

*Corolla yellow.* MALMESB. DIV.; S. 2428: PIQBG. DIV.; S. 1367, 2440, 5622.

FORM C. *Corolla* pale salmon (fading to yellow and then white in drying).

CAPE PENIN.; *W-Dod* 2629, S. 6814, 8184: CAPE DIV.; S. 775.

FORM D.—*O. stictophylla* Sond. and var. *major* Sond., var. *hantamensis* R. Knuth (not seen). Plant less hairy. *Petioles* sometimes slightly flattened. *Corolla* yellow (not fading when dried) or white.

*Corolla yellow.* CERES DIV.; *Wolverivier*, *Burke* & *Zey.* 261 (*O. stictophylla* Sond.), S. 2643: LAINGSBURG DIV.; S. 6054: CALVINIA DIV.; *Marl.* 10210, S. 2479, 7328: V. R's DORP DIV.; *Zey.* 241 (ex pte.), *Zey.* 242 (*O. stictophylla* Sond. var. *major*), S. 676A, 717, 1586, 1706B, 2489, 5328, 5333, 5470, 5606, 5611.

*Corolla white.* CLANW. DIV.; S. 2466: CALVINIA DIV.; S. 2474, 7339: V. R's DORP DIV.; S. 2501, 2519: NAMAQUALAND; S. 2523. Fl. May—July.

In most forms of the species the colour of the corolla fades and becomes indistinguishable in herbarium specimens. In the *types* of *O. stictophylla* (Zey. 261 and 242), however, the yellow colour of the corolla is still easily distinguishable, and although the colour fades away quickly in the majority of yellow specimens, it has been found that in those identical with and near Zeyher's specimens it remains intact. These specimens have been classified under Form D., but as the white-flowered plants cited above appear to be only colour forms of *O. stictophylla*, the character seems to be of little practical value.

FORM E.—*O. laburnifolia* Jacq. and var. *angustata* Sond.—*O. sanguinea* Jacq.—*O. arthropphylla* Turcz. Corolla fading to white when dried. Fl. May—July.

(i). *Medial leaflet* large, more or less cuneate-rotund, occasionally brown-mottled above. *Corolla* primrose or creamy yellow, more rarely white.

Yellow. PIQBG. DIV.; S. 664, 5623, Pillans 6631: CLANW. DIV.; Schltr. 7981, Leipoldt 289, S. 676, 724, 728, 744, 2149, 2448, 2600, 3423, 5613, 8126. White. CLANW. DIV.; S. 677, 6632.

(ii). *Leaflets* lengthening, showing gradual transition into Form E, (iii), the juvenile rotund. *Corolla* creamy yellow.

CLANW. DIV.; 4—5 miles west of Graafwater, S. 7247, 7243, 7245 (nearest *O. laburnifolia* Jacq.), Zey. 225 (ex pte.).

(iii). *Leaflets* narrowly rhomboid-oblong, the juvenile rotund. *Petiole* more compressed. *Corolla* creamy yellow.

V. R's DORP DIV.; between Olifant's River and Knakisberg, Zey. 225 (*O. laburnifolia* Jacq., var. *angustata* Sond.), Ouplaas Hills, west of Klaver, S. 5445.

It is rather doubtful whether Section (i) is really separable from Form D. The three sets of specimens in Section (ii), each from a separate colony, show, in the lengthening of the leaflets, a gradual transition into Section (iii) in which the medial leaflets are 2.5—4 cm. long and 3—5 times as long as broad.

Although the typical form of *O. laburnifolia* appears at first sight to be so distinct, I cannot find any definite line for its separation. In all these forms the juvenile leaflets, produced from bulbils, are rotund, which suggests that the variants arise from a common ancestor. No indications of hybridisation were observed even in the Ouplaas Hills where plants of Sections (i) and (iii) were growing in association in about equal numbers with no intermediate forms. A somewhat parallel instance of lengthening of the leaflets will be found in Form L.

FORM F.—*O. variabilis* Jacq., var. *nana* Sond. Dwarf. Leaflets concolorous. *Peduncle* short. *Corolla* rosy-purple or white, 1.2—1.7 cm.

See Notes (in  
End Papers) on  
re-instating *O.*  
*laburnifolia* and  
Forms A and B  
of var. *latifolia*



long, about 3 times as long as the sepals or less. *Filaments*, the longest 5—6 mm. long.

UITENHAGE DIV.; *E. & Z.* 714 (*O. breviscapa*, *O. variabilis* Jacq. var. *nana* Sond.), *Zey.* 132, 2117; P. ELIZ. DIV.; *Paterson* (B.H. 19798, *Long* 425: KNYSNA DIV.; *Duthie* 806: UNIONDALE DIV.; *S.* 3200, 6735: GEORGE DIV.; *S.* 3163, 3185, 6913. Fl. April—September.

The corolla in the typical form is very small, but intermediates make the isolation of the variety *nana* impracticable.

FORM G.—*O. breviscapa* Jacq. Dwarf. *Bulb* narrower, often rostrate. *Leaves* prostrate, glaucous above, purple beneath: petiole sometimes flattened. *Peduncle* usually short. *Corolla* white, 1—1.8 cm. long, about 3 times as long as the sepals or less. *Filaments*, the longest about 4 mm. long.

NAMAQUALAND; Steinkopf, *S.* 2588, 2592, 5556, Misklip, *Compton* (N.B. Gar. Kirstenbosch 2128/35), Kamieskroon *S.* 814, 918, 919. Fl. May—July.

The following are intermediate with Form A:—

Namaqualand; *S.* 5600: V. R's Dorp Div.; *S.* 5497, 5610.

In the more typical forms of *O. breviscapa* from the arid regions of Namaqualand there is some tendency for the bulb to become narrow and rostrate at the apex (a phenomenon possibly connected with the action of the contractile root in very hard ground), but this character is not sufficiently definite to warrant its consideration taxonomically. It seems probable that the *type* of *O. breviscapa* came from Namaqualand. In cultivation *S.* 814 from Kamieskroon, a form which is prevalent in northern Namaqualand and which in the wild state produces almost sessile flowers with a corolla about 1 cm. long, might well have served for a model for Jacquin's figure, t. 58. It was found, however, that a series of plants observed on proceeding southward, gradually merged into Form D. (white), Form H. (with 2 enlarged sepals) and the typical Form A.

*Schltr.* 7905, *Piqbg.* and *Drège*, Haazekraalrivier, appear to be Form A.

FORM H. *Leaflets* purple beneath. One or two of the sepals obtuse, broader and longer than the remainder. *Corolla* white, 1.6—2.5 cm. long.

CLANW. DIV.; *S.* 1369: V. R's DORP DIV.; *S.* 3336, 3386, 5312. Fl. June—July.

FORM I.—*O. decipiens* Schltr., non Prog.—*O. aemula* R. Knuth. Almost glabrous. *Leaves* very small, about 4—5 mm. diam. *Peduncles* as long as or longer than the leaves. *Corolla* rosy-purple, 1.7—2.3 cm. long.

TULBAGH DIV.; *Schltr.* 7837 (*O. decipiens* Schltr.): MALMESB. DIV.; *S.* 654A, 5481.

This is merely a form with very small leaflets.

✱ FORM J. Indument as in the typical form. *Leaflets* subacute, somewhat glaucous above, purple beneath, the medial broadly cuneate-rhomboid. *Corolla* large, rosy-purple or white.

CALEDON DIV. ; *Guthrie* (S. 1228B) : WORCES. DIV. ; *S.* 6826 (*white*), 6828 (*rosy-purple*), 6827 (*colour hybrid*). Fl. June—Aug.

Approaching Form L in the shape of the leaflets.

FORM K. Densely hirsute with shining white hairs. *Leaflets* subrotund, concolorous. *Corolla* rosy-purple, very large.

TULBAGH DIV. ; *S.* 2170, 6083, 6084.

Very near Form L, except in the shape of the leaflets.

FORM L. Indument as in Form K. *Medial leaflet* cuneate-rhomboid, acute at the apex, often twice as long as broad : juvenile leaflets subrotund. *Corolla* very large, rosy-purple.

TULBAGH DIV. ; *S.* 3451, 4537, 6085, *L. Bolus* (N.B. Gar. Kirstenbosch 1124/23 (cult.)). Fl. June.

This Form is plentiful but extremely local a few miles south of Tulbagh and grows very near a large colony of the Form K., but not actually in association with it. Though a striking variant, the existence of the more widely distributed Forms J. and K. makes me hesitate to give it varietal rank.

An exceedingly variable group-species, very common in the South Western District. Although the *types* of some of the species included as synonyms here may appear at first sight to be separable, just as are some of the easily recognised plants figured by Jacquin, they are, in reality, merely chance forms among an infinite number of micro-varieties and further intermediates show that they are not practical taxonomic units.

Although a number of the specimens cited have been placed separately under Forms B to L, each showing some salient character, intermediates and overlapping forms show the inadvisability of attempting to place them in named groups and, indeed, many of them are difficult to distinguish in the dried state.

The species *purpurea* can always be recognised by the faint pellucid streaks on the leaflets and sepals which turn dark in drying, by the narrow cyathiform (not funnel-shaped) corolla tube and by the bracts, which are low down on the peduncle. Such characters as the colour of the corolla, degree of indument, the shape and size of the leaflets and the occasional indistinct flattening of the petiole are not found in any regular combinations.

57. *O. melanosticta* Sond. Fl. Cap. I (1860) 333.—*O. melanosticta* Sond., var. *inconspicua* R. Knuth. Rather small, stemless, *Bulb* ovoid,

attenuate at the apex, 3—4 cm. long, with closely adhering gummy blackish-brown tunics. *Rhizome* commonly 5—8 cm. long, often puberulous. *Leaves* up to 20, rosulate: petioles rather densely villosopubescent, up to 2.5 cm. long: leaflets 3, sessile, rather thick, pubescent on both faces or more rarely glabrous, silky when young, ciliate with soft fine shining hairs, veined and copiously dotted with minute orange spots which turn black in drying, the medial cuneate-obovate, cuneate-obcordate, lightly incised, or rarely cuneate-rhomboid, often tapering attenuately at the base, always narrower than long, usually 0.7—1.1 cm. long, the lateral oblique, flattened or retuse along the interior margin. *Peduncles* 1-fl., up to 2.5 cm. long, but commonly very short, densely pilose, articulate close to the base: bracts 2, linear, alternate, 3—5 mm. long, edged with red calli towards the base. *Sepals* narrow-ovate or broadly lanceolate, 5—6 mm. long, pale, silky-pubescent, with 2 small apical calli. *Corolla* 2—2.5 cm. long, yellow or rarely cream-coloured, with a funnel-shaped tube: laminae of the petals obliquely cuneate-obovate, subtruncate, often finely purple-maculate about the outer margin, rather longer than the attenuate claw. *Filaments*, the longer 6—10 mm. long, pubescent or glandular-pilose, with rather long acute teeth. *Ovary* pubescent on the upper half, with elongate orange-red apical calli, the chambers 6-ovuled: styles pubescent below, glandular-pilose above. Seeds endospermous.

BEAUFORT WEST DIV.; Geelbeck, *Burke & Zey.* 258 (type in Herb. Sond.); LAINGSBURG DIV.: *B.H.* 21357, 21927, 21928, *Marl.* 14175, *S.* 3095, *Compton* 2614, 10861: SUTHERLAND DIV.; *Marl.* 3909, 9796, *S.* 3471: CALVINIA DIV.; *S.* 3494, 4467 (cream-coloured), 4463: CERES DIV.; Wolverivier, *Burke & Zey.* 265 (var. *inconspicua* R. Knuth), *B.H.* 19722: WORCES. DIV.; *S.* 2192, 6043, 6068: MONTAGU DIV.; *S.* 6070, *B.H.* 20101: PAARL DIV.; French Hock, *Marl.* 3910b. Fl. May—Aug.

Var. *β latifolia* Salter, var. nov. *Planta* gracilior. *Bulbus* minor. *Folia* satis pauca: foliola latissime cuneato-rotundata, 0.6—1 cm. longa, 0.8—1.4 cm. lata, lateralibus vix obliquis. *Corolla* major, ad 3.5 cm., etiam 4 cm. longa, pallide lutea. *Filamenta* breviora.

A slighter plant than the typical form, often with fewer leaves and a very large corolla. *Bulb* rather smaller. *Leaflets* very broadly cuneate-rotund, 0.6—1 cm. long, 0.8—1.4 cm. broad, the lateral scarcely oblique. *Peduncles* conspicuously articulate 7—10 mm. from the base. *Corolla* up to 3.5, even 4 cm. long, pale yellow. *Filaments* rather shorter.

V. R's DORP—CALVINIA DIVS.; summit of V. Rhyn's Pass, *S.* 5361 (type in Bol. Herb.), 704, 1606, 1648, 4477, *Pillans* 6632. Fl. Apl.—May.

This species is confined to the drier parts of the South Western District and does not occur on the coastal plains and flats. All the specimens cited by Sonder are poor and starved and the leaves are very young. The undulation (not crenulation) on the margins of the leaflets is an accident of drying which occurs in some species and is not present in living plants and var. *inconspicua* R. Knuth has therefore no claim to separation. The corolla is nearly always bright yellow in colour. There is considerable variety in the shape of the leaflets which tend to lengthen in cultivation.

Var.  $\beta$  is very much like some forms of *O. luteola* Jacq., but differs in the important character of the peduncular bracts.

58. *O. rubro-punctata* Salter, Journ. of S.A. Bot. II (1936) 153. Small, stemless, 2—3 cm. high. *Bulb* ovoid or at length subglobose, up to 3 cm. long, attenuate-acute at the apex: tunics dark brown, with soft brown ascending hairs at the apex. *Rhizome* about 7 cm. long, often reddish. *Leaves* 2—6, subprostrate: petioles 1—2 cm. long, sparsely and minutely pilose, dilated below the basal articulation: leaflets 3, sessile, broadly rotund, slightly cuneate-attenuate at the base, emarginate (the lateral sometimes entire), 4.5—9 mm. long, 6—11 mm. broad, glabrous, dark green above, deep purple beneath, with numerous minute transparent red dots or glands. *Peduncles* 1-fl., 2—4 mm. long, deflexed and lengthening after flowering, reddish, sparsely pilose: bracts near the base, lanceolate, conduplicate, alternate or subopposite, 3—3.5 mm. long, ciliate near the base, with elongate orange calli particularly on the upper part. *Sepals* narrow-obovate, acute or obtuse, 4—4.5 mm. long, glabrous or sparsely pubescent, with numerous orange calli near the margins. *Corolla* 2.5—3.5 cm. long, white, with a funnel-shaped yellow tube: laminae of the petals broadly cuneate-obovate, subtruncate, 1.2—1.5 cm. broad, conspicuously violet-dotted near the outer margin, longer than the tapering claw. *Filaments*, the shorter 3—4.5 mm., the longer 4.5—7 mm. long, sparsely and minutely pilose, with longish acute teeth. *Ovary* pubescent and rubro-callose on the upper half, the chambers 6-ovuled: styles pubescent below, glandular-pilose above. *Capsule* globose. Seeds endospermous. (Fig. 17.)

CALVINIA DIV.; near Bloedzuigerfontein, 1 mile south of Oorlog's Kloof River Bridge on the Calvinia—Clanwilliam road, S. 5371 (*type* in Bol. Herb.). Fl. May.

In the original description this species was placed as an affinity of *O. zonulata* L. Bolus, but the character and position of the bracts, near the base of the peduncle, which is without an upper articulation, show it to be more nearly related to *O. melanosticta* Sond.



## Sect. F. FOVEOLATAE.

Leaflets 3 (except in *O. Nortieri*, one), usually rather fleshy, with large epidermal cells, more or less conspicuously impresso-punctate when dry. Petioles often winged at the base. Leaflets broad (except in *O.*

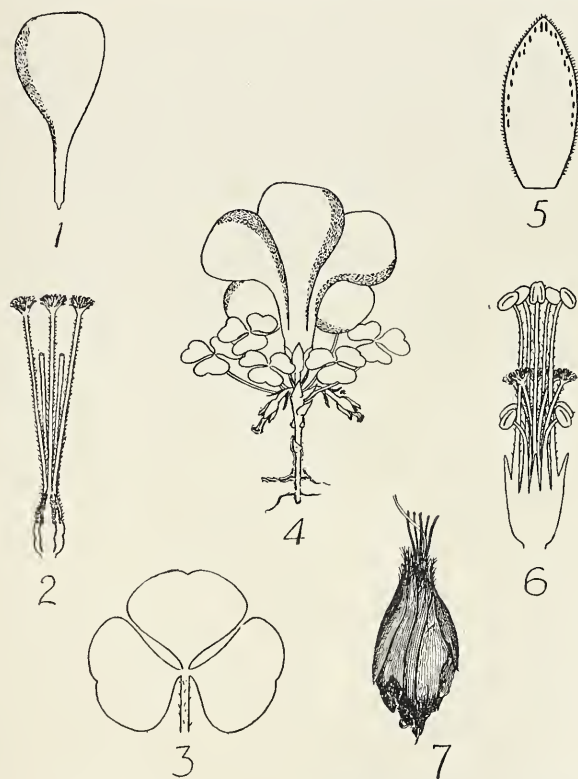


FIG. 17. *Oxalis rubro-punctata*, Salter. 1. Petal, natural size. 2. Gynaecium  $\times 6$ . 3. Leaf  $\times 3$ . 4. Plant, natural size. 5. Sepal  $\times 5$ . 6. Androecium  $\times 6$ . 7. Bulb, natural size. (Salter 5371.)

*Fourcadei* and *O. pulchella*, var. *leucotricha*, oblong). Stemless or in *O. convexula*, *O. ataquana* and *O. extensa* with a short stem. Seeds endospermous, except in *O. furcillata*.

Though not all close affinities, the species are so placed as to bring

those which are most closely related into juxtaposition. (See Group 6 in *Analysis of the Species*.)

The last two species have bifurcate leaflets which are not fleshy, but they seem to be most closely related to the later species in this Section.

Stem usually exserted	.. .. .	..	..	Sp. 59—60
Stemless	.. .. .	..	..	Sp. 61—81
Associated species without fleshy leaflets, the leaflets bifurcate	.. .. .	..	..	Sp. 82—83

59. *O. convexula* Jacq. Oxal. (1794) 92, t. 55. Erect, rather succulent, 4—14 cm. high, entirely glabrous, usually with a well-developed and sometimes branched stem. *Bulb* narrow-ovoid, attenuate or subrostrate at the apex, 2—3 cm. long, the older often persisting on the rhizome through the action of the contractile root: tunics imbricating, rather thin, rough, reddish-brown. *Stem* thick, 2—5 cm. long or rarely not exserted. *Leaves* often numerous, short and closely congested or spreading, up to 5 cm. long: petioles dilated into prominent submembranaceous stipuliform wings below the articulation: leaflets 3, thick, fleshy, entire, the medial shortly petiolulate, subrotund, widely attenuate at the base, 4—10 mm. long, 5—12 mm. broad, the lateral obliquely rotund or sub-semicircular, rather smaller, conspicuously impresso-punctate on both sides (very irregularly on the scurfy lower surface) when dry. *Peduncles* 1-fl., 1—5 cm. long, usually longer than the leaves, with 2 alternate linear or oblanceolate membranous bracts towards the calyx. *Sepals* ovate or oblong-ovate, obtuse, submembranaceous, 3—5.5 mm. long, ecallose. *Corolla* 1.6—2.6 cm. long, pale salmon-rose, with a short widely funnel-shaped yellow tube: laminae of the petals broadly and obliquely cuneate or subtriangular, obliquely truncate, twice or three times as long as the attenuate claw. *Filaments*, the shorter 2.5—4 mm., the longer 4—8.5 mm. long, minutely glandular, edentate, the longest exserted from the corolla tube. *Ovary* oblong, sometimes minutely glandular-pilose on the upper half, ecallose, the chambers about 18-ovuled: styles sparsely and minutely glandular-pilose.

RIVERSDALE Div.; *B.H.* 20119; MONTAGU Div.; *B.H.* 15125, 15622, *S.* 1049, 1079, 6075; LAINGSBURG Div.; *Compton* 2580; CERES Div.; *Marl.* 9005, 9071; ROBERTSON Div.; *Marl.* 11832; SWELLENDAAM Div.; *S.* 6170. Fl. June—September.

This species was entirely misunderstood by Sonder and none of the specimens cited by him belongs here, but rather to *O. depressa* E. & Z., quite a different plant. The true *O. convexula* may be distinguished from these by its marked succulence, paler bulb with thinner and rougher tunics, thick exserted stem, larger epidermal cells in the leaflets and salmon-pink corolla with a shorter tube and exserted stamens. It has also been confused with *O. obliquifolia* Steud.

The leaflets of the specimens cited here agree exactly with those given to Sonder from Jacquin's herbarium. I have seen no plants, either wild or cultivated, as large as that depicted by Jacquin, nor any producing aerial bulbils in the leaf-axils. (*Since seen*)

The species is extremely tenacious of life and specimens, unless poisoned, continue to grow for some time in a botanical press.

- \* 60. *O. attaquana* Salter, Journ. of S.A. Bot. I (1935) 78. Erect, with an exserted stem, up to 13 cm. high, clothed on many parts with long hyaline pluricellular hairs. *Bulb* ovoid, attenuate, at the apex, 1.5–2 cm. long with a contractile root : tunics blackish-brown, longitudinally ribbed. *Stem* simple or bifurcate, glabrous, with several large brown ovate or ovate-lanceolate cuspidate amplexicaul scales from 2–7 mm. long. *Leaves* 8–24, congested or loosely imbricate on the upper part of the stem : petioles up to 3 cm. long, squamiform below the basal articulation : leaflets 3, the medial shortly petiolulate, the lateral sessile, obreniform, attenuate at the base, up to 5 mm. long, 9 mm. broad, the lobes rounded at the apex, rather fleshy, conspicuously impresso-punctate when dried, glabrous above, sparsely ciliate with pluricellular and admixed capitate hairs on the margins and mid-rib beneath. *Peduncles* 1-fl'd., axillary, about twice as long as the leaves, with 2 alternate linear bracts above the middle. *Sepals* broadly lanceolate, subobtus, about 5 mm. long, ecallose, often purplish. *Corolla* 1.6–2 cm. long, rose, with a narrowly funnel-shaped pluricellular-pilose yellow tube : petals obliquely cuneate, slightly attenuate at the base, rounded at the apex, 5–8 mm. broad. *Filaments* glandular-pilose, the shorter 3–5.5 mm., the longer 5–8 mm. long, unequal, edentate. *Ovary* glandular-pilose on the upper part, the chambers 8-ovuled : styles glandular pilose. Fig. 18.

OUTDSHOORN DIV. ; Attaquas Range, near Moeras River, 10 miles north of Robinson Pass, S. 2341 (*type* in Bol. Herb.). Fl. June.

- The long shining pluricellular hairs give the plant a dewy appearance.
- \* 61. *O. foveolata* Turcz., Bull. Soc. Nat. Mosc. XXXI, 1 (1858) 435.—*O. calligera* Sond. Dwarf, stemless, about 3 cm. high. *Bulb* (mature) ovoid, acute at the apex, 5.5 cm. long, 3.5 cm. diam., with dark brown gummy tunics. *Rhizome* very slender, often 10 cm. long, with a few small semiamplexicaul scales, those at the apex larger. *Leaves* 6–10 : petioles, like the peduncles, rather coarsely cano-pubescent, often 1–2 cm. long : leaflets 3, subsessile, rather fleshy, conspicuously impresso-punctate on both faces when dry, glabrous or pilose above, more or less pilose beneath, sometimes callose on the anterior margin, the medial rotund above, more or less cuneate-attenuate towards the base, 5–7 mm. long, 4–6 mm. broad, the lateral oblique, rather smaller and narrower, often slightly retuse on the inner margin. *Peduncles* 0.5–2 cm., long,

with 2 callus-tipped alternate bracts above the middle. *Sepals* ovate-oblong, about 4 mm. long, pubescent, ciliate, straw-coloured, sometimes purple-striate on the margins, with 2 or more calli at the apex. *Corolla* 2.2—2.4 cm. long, yellow, with a cylindrico-funnel-shaped tube : laminae of the petals cuneate-obovate subtruncate, about 9 mm. broad, slightly longer than the narrow claw. *Filaments*, the shorter 6—9 mm., the longer

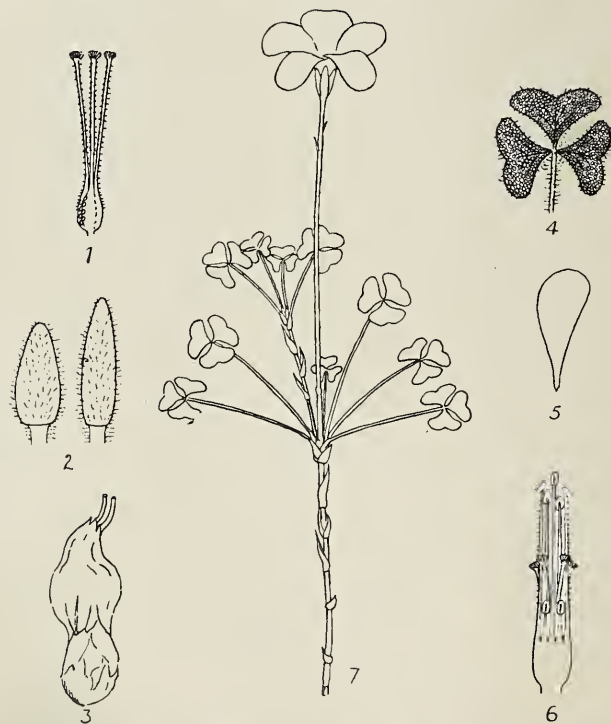


FIG. 18. *Oxalis attaquana* Salter. 1. Gynaecium  $\times 4$ . 2. Sepals  $\times 3$ . 3. Bulb, natural size. 4. Underside of leaf  $\times 2$ . 5. Petal, natural size. 6. Androecium, showing styles  $\times 4$ . 7. Plant, natural size. (Salter 2341.)

10.5—14 mm. long, very minutely glandular-pilose, edentate. *Ovary* densely pubescent, the chambers about 7-ovuled, ecallose : styles viscous, the longest 14 mm. long, well exserted from the corolla tube. Seeds endospermous.

NAMAQUALAND or V.R.'s DORP DIV. ; rocky hills and sandy flats of Bitterfontein, from Kammass to Lieslap, *Zey.* 238 ; Springbok, *S.* 913,



3784 (cult.): KENHARDT DIV.; Augrabies, *Leipoldt* (B.H. 21728). Fl. Apl.—May.

Resembling var. *beneprotecta* of the following species, but differs in its longer and narrower corolla tube and much longer exerted stamens and styles. The specimens cited are certainly the same as *Zey*. 238. The "rather small" bulb described by Sonder cannot have been mature. The leaflets are not tomentose (see note under *O. pulchella* Jacq., var. *tomentosa*) and the lamina of the corolla is yellow, not rosy. The locality of the type is somewhat vague, but it is not from Bechuanaland.

\* 62. *O. pulchella* Jacq. Oxal. (1794) 109, t. 69.—*O. marginata* Jacq.—*O. sulphurea* Jacq. (For further synonymy see under the varieties). Stemless, rather fleshy, 3—6 cm. high, more or less hirsute with hyaline whitish hairs. Bulb obclavate or narrow-ovoid, attenuate or rostrate at the apex, commonly 3—5 cm. long, or longer, often contorted: tunics rough, gummy, dark brown, the younger vertically ridged. Rhizome rather robust, with large broadly ovate scales near the apex, often partly enclosed within the old tunics through the action of the contractile root. Leaves 6—30, suberect or prostrate: petioles usually 0.5—3 cm. long, densely hirsute: leaflets 3, subsessile, fleshy, with large epidermal cells, conspicuously impresso-punctate on both faces and very irregularly scurfy beneath when dry, pilose beneath, but along the veins only on the upper surface, ciliate, the medial subsecuriform, semicircular in the upper half, retusely attenuate towards the base, 0.9—1.3 cm. long, 1—1.5 cm. broad, emarginate, the lateral rather smaller and narrower, retuse on the inner margin. Peduncles 0.5—1.5 cm. long, or rarely longer, pilose: bracts 2, linear, alternate, near the base, rubro-callose on the upper part. Sepals ovate-oblong, obtuse, 3.5—4.5 mm. long, submembranous, pale straw-coloured, often sparsely pilose, ciliate, with 2 or more elongate reddish apical calli. Corolla glabrous, about 2 cm. long, white, pale yellow or pale salmon-rose, with a funnel-shaped pale yellow tube: laminae of the petals broadly cuneate or cuneate-obovate, obliquely subtruncate at the apex, rather longer than the claw. Filaments, the shorter 2.5—4.5 mm., the longer 4—7 mm. long, glabrous or minutely glandular-pilose, edentate. Ovary more or less hirsute on the upper half, ecallose, the chambers many-ovuled: styles glandular above, with some simple hairs below. Seeds endospermous.

*Typical form.* Leaflets dark green, pilose on the nerves on the upper surface.

NAMAQUALAND; Garies area, Darter's Grave, S. 3707 (corolla pale salmon-rose).

My specimens S. 3707 which were compared with Jacquin's type in Vienna by Dr. K. Keissler, only differ in the colour of the corolla and in

being rather more hairy. This is the only collecting with hairs on the nerves of the upper surface of the leaflets and it is undoubtedly inseparable from the typical form which includes the two synonyms given above. See Journ. of S.A. Bot. VII (1941) 166, f. 1. My specimens had not the vivid red colour on the under surface of the leaflets depicted by Jacquin, nor have they shown it in cultivation, but the leaflets of var. *glauca* sometimes show this character, though not to such a pronounced degree.

Var.  $\beta$  **tomentosa** Sond.—*O. Edwardsiae* Bolus f. *Leaflets* rotund, greenish, usually glabrous above, with numerous minute calli along the margin, the medial usually as broad or broader than long. *Corolla* pale rose or salmon-rose, the laminae of the petals proportionately longer and broader than in the typical form.

MALMESB. DIV.; Grootpost, *E. & Z.* 711 (*O. pulchella*—type), *B.H.* 14555: PIQBG. DIV.; *Edwards* 73 (*O. Edwardsiae* Bolus f.), *S.* 5291, Grey's Pass, *Mader* 2139, *B.H.* 19704, 19705, *S.* 747, 1256, 1684, 3328, 4428, 5403: V.R.'s DORP DIV.; between Olifant's River and Knakisberg, *Zey.* *S.* 925, 5350: WORCES. DIV.; near De Doorns, *S.* 2184, 6041: SWELLENDAM DIV.; *B.H.* 20115. Fl. May—June.

Zeyher's Knakisberg specimens belong here, but those from Eenkoker belong to the next variety. His numbers appear to have been erroneously interchanged by Sonder in Flor. Cap. and it is safer to cite them by locality only. Zeyher's specimens in this species have been mixed up in some herbaria. I cannot agree with Sonder that the leaflets are tomentose, though the hairs overlying the collapsed cells give them that appearance. The name is unfortunate for the next variety is more hairy.

Var.  $\gamma$  **glauca** Salter, Journ. of S.A. Bot. VII (1941) 165. Plant more densely hairy. *Leaves* glaucous-grey: leaflets evenly pilose or glabrescent above, rarely purple-mottled, sometimes with a few inconspicuous calli at the apex, the medial more or less rotund, broadly cuneate or subrhomboid. *Corolla* 2—3 cm. long, pale yellow or white, with a yellow tube: laminae of the petals 0.9—1 cm. broad, somewhat truncate at the apex.

NAMAQUALAND; between Hartebeeste River and Eenkoker, *Zey.*: Garies area, *S.* 2530, 2555, 3398, 6650, 6659, 6671: Kamieskroon area, *B.H.* 19988, *S.* 803A, 806, 847, 850 (type in Bol. Herb.), 870A, 1406A, 2568, 4600, 4613: Springbok area, *S.* 908, 2579: Steinkopf area *S.* 5548, 5551. Fl. June—July.

*O. setifera* R. Knuth, described and named from a fragment without flowers, is this variety. See note under var.  $\beta$  as regards the number of Zeyher's specimen.

\* Var. ♂ *leucotricha* (Turcz.) Salter, Journ. of S.A. Bot. loc. cit. 165.—*O. leucotricha* Turcz.—*O. albida* Sond. Leaflets oblong or ligulate, tapering slightly towards the base and apex, obtuse, sparsely hirsute above and on the conspicuous medial nerve beneath, the medial up to 4·5 cm. long, 0·7 cm. broad, the lateral slightly oblique, somewhat smaller, the leaflets of the young bulbils more or less rotund, lengthening progressively: petioles and peduncles densely hirsute. Corolla 2—3 cm. long, pale yellowish salmon. Ovary glandular-pilose on the upper half, with a few hyaline hairs near the apex, the chambers about 10-ovuled. (Fig. 19.)

NAMAQUALAND; between Hartebeste River and Enkoker, Zey. 228, ex pte. (*O. leucotricha* Turcz.), 6½ miles west of Garies, S. 6651. Fl. June.

*O. leucotricha* is no more than a variety of *O. pulchella*. This plant was fully redescribed and figured in *Journ. of S.A. Bot.*, since normal specimens can scarcely be recognised from the description of Zeyher's poor starved material. It has pale yellowish salmon flowers and it is very doubtful whether the flowers of the type (Zey. 228) were yellow as stated by Sonder, at any rate they are now colourless. My specimens are almost identical with S. 6650, var. *glauca*, except for the shape of the leaflets. Since the leaf history (i.e. the rotundate juvenile leaflets) was not previously known, it is perhaps not surprising that its affinity was not formerly recognised.

\* Var. ♂ *beneprotecta* (R. Knuth) Salter. loc. cit.—*O. beneprotecta* Dinter ex R. Knuth. Plant smaller in all parts, the hairs thinner. Leaves rosulate, spreading, often very numerous (up to 200) and forming dense, flat tufts: leaflets glaucous-grey, almost glabrous, the medial cuneate, rotund at the apex, or cuneate-rhomboid, 3—8 mm. long: petioles usually pilose, the lower up to 4 cm. long, the upper progressively shorter. Peduncles very short. Corolla about 2 cm. long, rather pale yellow: tube rather broad. Longest styles or stamens 7 mm. long.

S.W. AFRICA; Vahldorn, *Dinter 5182 (type)*, NAMAQUALAND; Louwpoort, S. 4590, near Kamieskroon, S. 1407, 9 miles north of O'Okiep, S. 2585.

Dinter's specimens are less hairy and have far fewer leaves than those from Louwpoort and Kamieskroon, which were growing in rock crevices and had large distorted bulbs, but the two forms are evidently not separable.

Var. *glabrata* Sond., Drège, Langvalei, is *O. luteola*. The leaves appear to have been diseased.

63. *O. depressa* E. & Z., Enum. I (1836) 91, No. 713, ex pte.\* (*A group-species*).—*O. inops* E. & Z.—*O. americana* Schltr.—*O. otaviensis*

\*Some specimens under the number E. & Z. 713 are *O. algoensis* E. & Z.

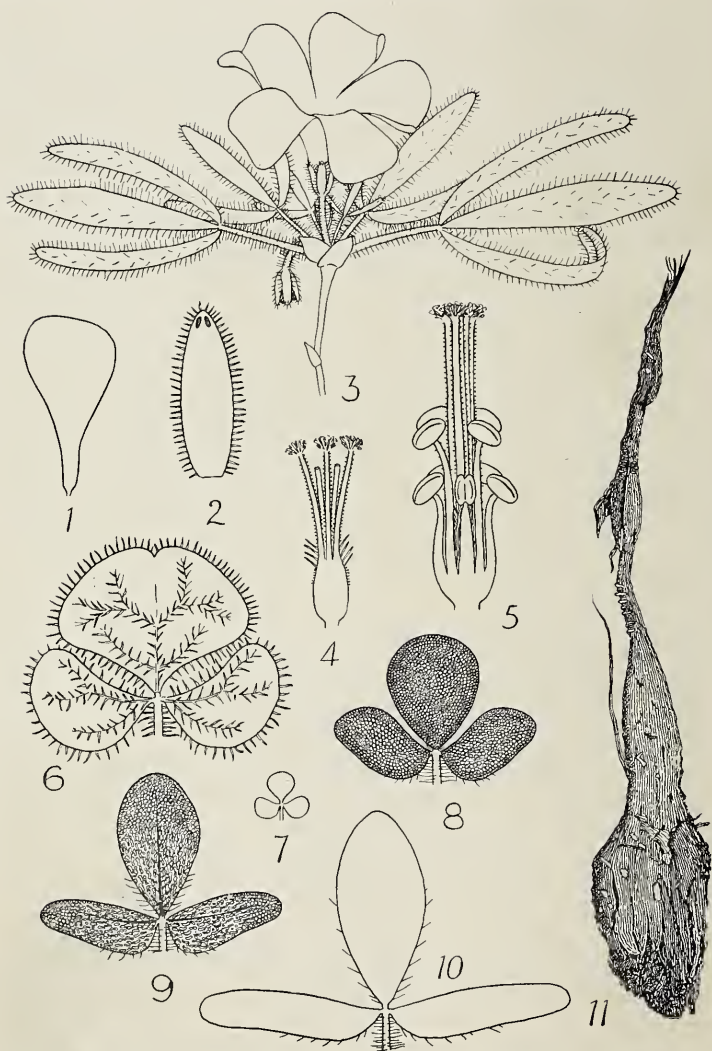


FIG. 19. *Oxalis pulchella* Jacq., var. *leucotricha* (Turcz.) Salter. 1. Petal, natural size. 2. Sepal  $\times 5$ . 3. Plant, natural size. 4. Gynaecium  $\times 6$ . 5. Androecium  $\times 6$ . 6. Leaf of *O. pulchella*, upper side. 7, 8, 9 and 10. Leaves of var. *leucotricha* showing progressive lengthening of the leaflets (8, upper side and 9, under side of dried leaf showing the pitting due to the collapse of the cells), all  $\times 2$ . 11. Bulb, natural size. (Salter 6651.)



R. Knuth.—*O. convexula* Jacq., var. *dilatata* Sond.—*O. commutata* Sond., var. *pusilla* R. Knuth. Stemless, almost glabrous, 4—12 cm. high. *Bulb* ovoid or oval, attenuate at the base and apex, often 2 cm. long : tunics dark brown, hard, sometimes prominently nerved, usually narrowly keeled along the mid-rib. *Rhizome* 3—8 cm. long. *Leaves* few or many, often 3—10 : petioles glabrous, at least the outer dilated into membranous and often ciliate stipuliform wings below the articulation : leaflets 3, sessile, the medial broadly rotund or subtriangular, broadly cuneate or cuneate-attenuate at the base, rounded (sometimes emarginate), flat, retuse, or in some forms sub-bilobed at the anterior margin, usually 3—7 mm. long, 5—10 mm. broad, the lateral rather narrower and often entire, glabrous, rarely sparsely ciliate, rather fleshy, impresso-punctate on both faces when dried, ecallose or with few or many small black calli along the upper margin. *Peduncles* 1-flid., much longer than the leaves, 1—10 cm. long, with 2 alternate linear bracts a little below the calyx. *Sepals* linear-oblong or lanceolate-oblong, obtuse, 5—8 mm. long, sometimes ciliate and penicillate, often purpurascens, especially on the margins, usually with 2 (rarely more) apical calli, very rarely ecallose. *Corolla* 1.5—3 cm. long, white, rosy or violaceous, with a rather widely funnel-shaped yellow tube : petals more or less cuneate, subattenuate towards the base, rotund or obliquely subtruncate at the apex. *Filaments*, the shorter, 3—4.5 mm., the longer 5—9 mm. long, edentate or slightly gibbose. *Ovary* usually glandular-pilose on the upper half, the chambers many-ovuled : styles glandular. Seeds endospermous.

TRANSVAAL ; Galpin M. 51, Sutton 264, Theron 869 : O.F. STATE ; Caledon Riv., Zey. 270, Bolus 11041, Potts 162, Burt-Davy 12764 : BECHUANALAND ; Rennie (S. 5782), Mogg 8631, Henrici 50 : BASUTOLAND ; S.A.M. 6142 : GRIQUALAND W. ; Pole Evans 97 : PRIESKA ; Bryant J. 62 : KIMBERLEY ; S.A.M. 26917, Fogarty 3852 : KALAHARI ; B.H. 21265, McGregor Mus. 2992 : QUEENSTOWN ; Galpin 1969, 2278, (cited in Pfech-Ox. as *O. obliquifolia*) : TEMBULAND ; Pegler 1640, Flanagan 2678 : BATHURST DIV., Britten 2083 : ALBANY DIV. ; Dyer 2393 : ALEXANDRIA DIV. ; Galpin 10805, B.H. 19782 ex pte. : UTENHAGE AND P. ELIZ. DIVS. ; E. & Z. 713, ex pte. (*O. depressa* E. & Z. —type), E. & Z. 728 (*O. inops* E. & Z.), Zey. 2123, 2124, Dieterlen 170, B.H. 19788, 19795, 20145, Paterson 612, 633, 2273A, 2706, 2711, S. 380/90 : HUMANSDORP DIV. ; Fourcade 2177 : BEAUFORT W. ; Zey. 242, 243, 267, 268, 269, S. 4414, B.H. 15165, 19201 : M. BAY DIV. ; S. 2346 : SWELLENDAM DIV. ; S. 2328, 2333 : MONTAGU DIV. ; B.H. 21662, S. 6074 : CORREPTON 3963 : CERES DIV. ; Wolverivier, Zey. 260, S. 2213A : W. ACES. DIV. ; S. 2181, 2183, 2190, 2197, 2200 : BREDASDORP DIV. ; S. 10436 (*O. commutata* Sond., var. *pusilla* R. Knuth).

Guthrie 30B : CALEDON DIV. ; Schltr. 10328 (*O. Dammeriana* Schltr.), Bolus 9900, B.H. 20116, 20444, S. 1228, 3102, 3313, 6698 : CAPE PENIN. ; near Retreat, Bolus 7176, S. 8073 : S. RHODESIA Teague 347 : S.W. AFRICA ; Otavi, Dinter 5481 (*O. otaviensis* R. Knuth), 4659, 7333, Schoenfelder 473, 590, 871; 958.

The following with pluricellular hairs approach *O. setosa* Sond. :— BARKLY WEST ; Acock 224, 226.

A polymorphous group distributed over the greater part of South Africa and consisting of numerous micro-varieties which merge one into the other and do not appear to be taxonomically separable. Some forms were erroneously attributed by Sonder to *O. convexula* Jacq., which is, however, quite a different species with a succulent stem. The form *O. convexula* var. *dilatata* Sond. (*Zey.* 270), which has broader, subtriangular or rarely bilobed leaflets, is even more widely distributed than the typical forms, but there are intermediates which show that it is not a valid variety. Under dry conditions the flowers often appear before the full development of the leaves.

It is closely related to *O. obliquifolia* Rich. and possibly the two species merge into one another, but *O. obliquifolia* seems to be generally larger and more robust, without calli on the sepals or they are very indistinct.

The specimens from S.W. Africa suggest that it may occur right across Bechuanaland.

64. *O. obliquifolia* Steud. ex Rich. Tent. Flor. Abyss. I (1847) 123. (*Description of the South African form.*) Stemless, 6—15 cm. high. *Bulb* ovoid or globose, attenuate at the base, acute, or shortly rostrate at the apex, up to 2 cm. long, with roughly veined dull brown tunics. *Rhizome* slender, rather long, with several amplexicaul scales. *Leaves* ascending, 4—12, rarely more numerous : petioles usually 2—8 cm. long, more or less pilose, the outer shortly stipulate below the basal articulation : leaflets 3, subsessile, rather broader than long, the medial securiform, more or less semicircular and often emarginate in the upper part, abruptly attenuate to the base, 0.8—1.8 cm. long, 1.2—2.5 cm. broad, the lateral oblique, often smaller, rather fleshy, impresso-punctate when dried, often with 2 or many rather obscure orange-brown calli near the anterior margin, glabrous or sparsely villose above, usually villose with a conspicuous medial nerve and sometimes livid purple beneath, ciliate. *Peduncles* 1-fl., as long as or longer than the leaves, villose or hirsute, with 2 alternate linear or lanceolate bracts, up to 5 mm. long, towards the calyx. *Sepals* oblong or ovate-lanceolate, subacute, 4.5—6.5 mm. long, more or less sparsely pilose, rarely with 2 small orange-brown apical calli. *Corolla* 1.4—2.3 cm. long, rosy or rosy-violet, rarely

white, with a rather widely funnel-shaped yellow tube : petals subeuneate, the slightly attenuate claw somewhat oblique. *Filaments*, the shorter 3—5 mm., the longer 4.5—6.5 mm. long, glandular-pilose, shortly toothed or gibbose. *Ovary* more or less pilose on the upper half, the chambers about 8-ovuled : styles glandular-pilose, usually with longer simple hairs admixed. *Capsule* about as long as the calyx. Seeds endospermous. Rarely producing double flowers

TEMBULAND ; *Bolus* 8821 : Southern Drakensberg Mts. ; *Galpin* 6594, 6595, 6596 : GRIQUALAND E. ; *Tyson* 3099, *Schltr.* 6595 : BASUTOLAND ; *Phillips* 767 : NATAL ; *Wood* (S.A.M. 14639), *Schltr.* 6596, 6774, 6873, *Galpin* (B.H. 20034), *Mogg* 6995, *West* 20, *Mundy* 3763 : O.F. STATE ; *Bolus* 8135, *Flanagan* 1936 : SWAZILAND ; S.A.M. 2569 : TRANSVAAL ; *Bolus* 11040, 11741, *Pott* 4964, *Rogers* 14409, 14521, 18181, *Schltr.* 3887 (var. *hirsuta* R. Knuth), *Nation* 95, *Galpin* (B.H. 20330, 20345), *Wager* A113, *Burt Davy* 2856, *Hutchinson* 2617, *Scholars* 171 : RHODESIA ; *Eyles* 1483, *Teague* 308, 347, *Kolbe* 4143, 4315 : Loc. ? S. 1937.

The following are intermediate with *O. setosa* E. Mey. ex Sond., having short pluricellular gland-tipped hairs on the peduncles —

TRANSVAAL ; *Burt Davy* (Pretoria Mus. 12764) : KING W'S TOWN DIV. ; S. 4404.

The South African form of this species (which in many herbaria has been erroneously attributed to *O. convexula* Jacq.) seems to be considerably larger and more pilose than the typical Abyssinian form. Var. *hirsuta* R. Knuth is only an extreme form and, owing to the occurrence of intermediates, does not seem to be separable.

I have not seen either of the authenticated specimens of var. *transvaalensis* R. Knuth, "Quam typus 2—3-plo major, ceterum toto modo aequalis" (*Wilms*, Pretoria and Lydenburg), but judging from the great epharmonic variability of the species and from the range in measurement in other specimens from the same localities, it is evident that mere size does not constitute a varietal difference.

The specimens from Rhodesia have two rather inconspicuous apical calli on the sepals, as described in Pfeich-Ox., but all the others are ecallose.

\* 65. *O. setosa* E. Mey. ex Sond., Fl. Cap. I (1860) 334. *Sonder's description is as follows* :—Stemless ; the long petiole and the scape setose with rigid, jointed hairs ; petioles 3-uncial ; leaflets rounded, wider than long, rarely subretuse, thin, veiny, dotted on each side, ciliate with glands, the medial 5—6 lines wide, 4—5 long, the lateral equal or smaller ; scape equalling the leaf ; sepals lanceolate, pilose and minutely callous, 4 times shorter than the corolla ; corolla 6 lines long, with a

yellowish tube and pale limb; lamina of the petals rounded.

Hab. Grassy places at Omsamwubo and Omsamcaba, Drège 5248. Port Natal, Sanderson, Oct. (*Merely copied in Pflrch-Ox.*)

In Sonder's herbarium (Stockholm) there are 3 leaves and 2 shrivelled flowers from Drège 5248—"Sp. unic." Two petioles have soft pluricellular hairs and one petiole and both peduncles have weak simple hairs, not setaceous or rigid. I have not seen Sanderson's plant, but I am of opinion that the specimens cited below, from which a revised description is given, belong to the same species as the first two leaves referred to above.

*Revised description.* Lax, stemless, up to 10 cm. high. *Bulb* narrow-ovoid, attenuate at the base, shortly rostrate at the apex, the tunics coarsely veined, dark brown. *Leaves* up to 15, suberect: petioles slender, 3—8 cm. long, with long weak pluricellular hairs, articulated 6—8 mm. from the base, dilated and the outer shortly stipulate below the articulation: leaflets 3, very shortly petiolulate, the medial very broadly rotund above, shortly and abruptly attenuate to the base, 5—8 mm. long, 7—12 mm. broad, glabrous and impresso-punctate on both faces when dried, sometimes glandular-ciliate, ecallose. *Peduncles* 1-fl'd., rather slender, as long as to twice as long as the leaves, like the sepals pilose with long weak pluricellular hairs, with 2 alternate linear bracts a little below the calyx. *Sepals* broadly lanceolate, acute, 4.5—5 mm. long, ciliate, ecallose. *Corolla* white, up to 1.7 cm. long: tube yellow. *Capsule* oval, not longer than the calyx. Seeds endospermous.

ALICE; *Pappe* (S.A.M. 21669): TEMBULAND; *Bolus* 3819: Kentani; *Pegler* 1808, 2014.

The following is smaller in all parts and has more rotund leaflets. *Corolla* white. It closely resembles *O. punctata* L. f., but the long pluricellular hairs are not gland-tipped and the bulb is larger and not angled.

KING W'S TOWN; *Leighton* (S. 4368).

(Note:—*Flanagan* 1280 and 2327 (without bulbs) have been referred to under *O. punctata* L. f.)

*O. setosa* seems on the one hand to be somewhat intermediate between *O. obliquifolia* Rich. (S. African form) and *O. depressa* E. & Z., resembling some specimens of the latter very closely, and on the other, to merge gradually into *O. punctata* L. f.

This and the two foregoing species form a very complex group and no very satisfactory divisions have been found. I am not familiar with the more eastern and northern forms in the wild state and have found many of the dried specimens difficult to place.

✱ 66. *O. reflexa* Salter, Journ. of S.A. Bot. I (1935) 140. Small, stemless or with a very short stem, entirely glabrous. *Bulb* ovoid or narrow-



ovoid, often 2·5 cm. long : tunics hard, dark brown, attenuate, curved and sharply acute at the apex. *Rhizome* about 5 cm. long. *Stem* none or short, like the rhizome bearing scales. *Leaves* 2—6, basal or apically congested, with petioles 0·5—2 cm. long, with stipule-like membranous wings below the articulation : leaflets 3, sessile, rather thick, impresso-punctate on both faces when dried, the medial very broadly rotund, slightly attenuate at the base, emarginate, 0·6—1·1 cm. long, 0·7—1·5 cm. broad, the lateral smaller, entire, obliquely rotund or transversely elliptical. *Peduncles* 1-fl., much longer than the leaves, 2·5—5 cm. long, with 2 minute alternate linear bracts a little below the calyx. *Sepals* oblong or linear-oblong, obtuse, 4·5—6 mm. long, usually dark purple towards the apex, with 2 inconspicuous red apical calli. *Corolla* small, reddish-purple or white, with a funnel-shaped yellow tube : petals narrow-cuneate, obliquely subtruncate or slightly retuse at the apex, 1—1·4 cm. long, 3·5—4 mm. broad, conspicuously reflexed. *Filaments*, the shorter 2—3·5 mm., the longer 3·5—5·5 mm. long, glandular-pilose, edentate. *Ovary* glabrous or glandular on the upper half, with elongate calli, the chambers 8-ovuled. *Capsule* subglobose. Seeds endospermous. (Fig. 20.)

V. R's. DORP DIV. ; on dry stony hill sides, 16 miles north east of V. R's. Dorp, S. 5318 (*type* in Bolus Herb), 2495, 5327 (white) : Calvinia Div. : Nieuwoudtville Area, S. 4561, 7331 (white) Fl. May—June.

The two colour forms appear to be equally common, but they have not been observed in actual association.

- \* 67. *O. dilatata*. L. Bolus, Journ. of Bot. LXIX (1931) 48. Dwarf, stemless, 4—7 cm. high, almost glabrous. *Bulb* subfusiform, sometimes slightly angled, up to 1·7 cm. long, 6 mm. diam., with brown acuminate tunics. *Rhizome* slender, usually rather short. *Leaves* 4—6, somewhat erect : petioles up to 2 cm. long, stipulately winged below the articulation : leaflets 3, rather fleshy, with large epidermal cells, impresso-punctate on both faces when dried, the medial very broadly cuneate-rotund, often emarginate, 5—7 mm. long, 6—9 mm. broad, the lateral oblique, rather smaller, entire. *Peduncles* 1-fl., up to 6 cm. long, with 2 small alternate linear bracts on the upper part. *Sepals* linear-oblong, obtuse, 2—3 broadened with 2 blunt lateral spurs at the base, 4—6 mm. long, glabrous or ciliate, purple-striate, sometimes penicillate, often indistinctly bicallose at the apex. *Corolla* 1—1·8 cm. long, yellow or reddish, with a rather widely funnel-shaped tube : petals subcuneate, rounded at the apex. *Filaments* glabrous or minutely glandular-pilose, edentate, the longest 7 mm. long. *Ovary* glabrous, the chambers several-ovuled.

MONTAGU DIV. ; near Montagu, *Leipoldt* (B.H. 19125—*type* in Bol. Herb.) : P. ELIZ. DIV. ; *Paterson* 2530 : CERES DIV. ; *Leipoldt* (B.H.

22596) and (B.H. 22604, with a reddish corolla). Fl. April—May.

The three outer sepals have blunt lateral spurs at the base, but otherwise the species seems to differ little from some forms of *O. depressa* E. & Z. except in its yellow corolla. B.H. 22604, with a reddish

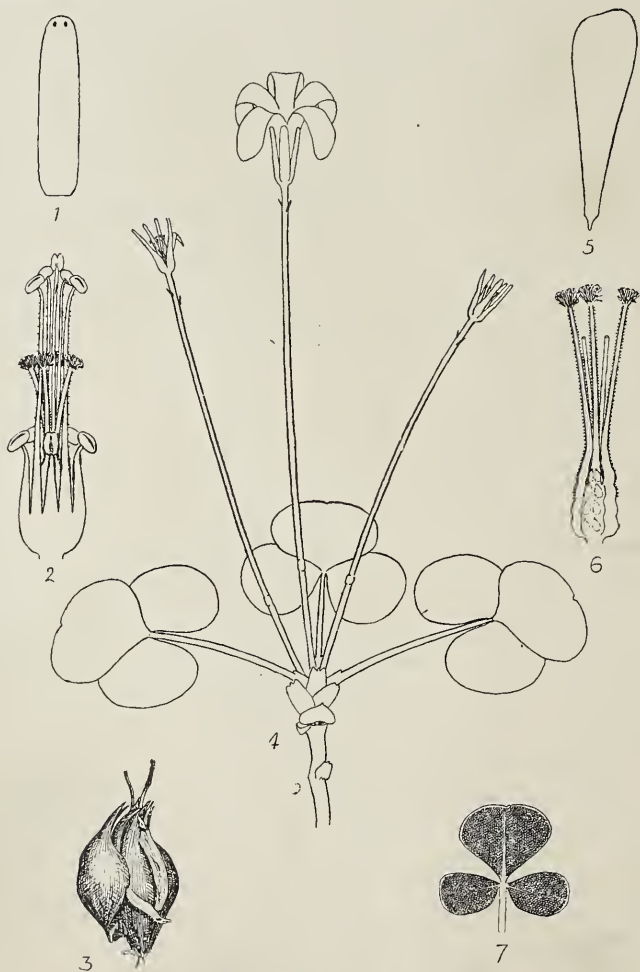


FIG. 20. *Oxalis reflexa* Salter. 1. Sepal  $\times 6$ . 2. Androecium, showing medium styles  $\times 8$ . 3. Bulb, natural size. 4. Plant  $\times 2$ . 5. Petal  $\times 3$ . 6. Gynoecium  $\times 8$ . 7. Underside of a leaflet (dried)  $\times 2$ . (Salter 5318.)

or mauve corolla, represented by one poor specimen, seems to be identical.

68. *O. Pocockiae* L. Bolus, Journ. of Bot. LXVIII (1930) 75.—*O. squamiflora* Weintroub. Rather weak, 5—14 cm. high, the stem rarely shortly exserted. *Bulb* narrow-ovoid, acute at the base and apex, with 4 longitudinal wings: tunies numerous, hard, dark brown, the outer adpressed together at the margin, thus forming the wings: aerial bulbils rarely produced in the leaf-axils. *Rhizome* 4—10 cm. long, the apical scales more or less ovate, rather large. *Leaves* basal or loosely imbricate on a shortly exserted stem: petioles up to 2.5 cm. long, glabrous or sparsely pilose, with stipule-like membranous and often ciliate wings below the basal articulation: leaflets 3, sessile, broadly cuneate-rotund, the medial usually emarginate or slightly incised, commonly 3—6 mm. long, 5—10 mm. broad, the lateral smaller, oblique, entire, rarely sparsely ciliate, thick, impresso-punctate on both faces when dried, often purple beneath, sometimes with 2 or more small black calli near the anterior margin. *Peduncles* 1-fl., longer than the leaves, with 2 alternate bracts above the middle. *Sepals* oblong-lanceolate, obtuse, 4.5—7 mm. long, sometimes penicillate at the apex, rarely ciliate, usually more or less purple, particularly on the margins, bicallose at the apex. *Corolla* 1.2—2.4 cm. long, rose or white, with a funnel-shaped yellow tube: petals broadly and obliquely oblanceolate, often acute at the apex, the claw slightly attenuate. *Filaments* minutely glandular-pilose, the longer edentate. *Ovary* glabrous or pubescent at the apex, rarely callose, the chambers 9—10 ovuled: styles pubescent. Seeds endospermous. Occasionally produces double flowers.

PRINCE ALBERT DIV.; Zwartberg, *Pocock* (B.H. 18910, type in Bol. Herb.), *Pocock* S. 90: LAINGSBURG DIV.; S. 2206; WORCES. DIV.; S. 2210: CERES DIV.; S. 2107, 2217, 2219, 2230: SUTHERLAND DIV.; Marl. 3910: CLANW. DIV.; *Stokoe* (S. 2043), B.H. 14591, S. 1653: V. R's. DORP DIV.; S. 706, 4478, 5359: CAPE PENIN. S. 8079, Duiker Point, *Bent* (B.H. 14940, cult.) *O. squamiflora* Weintroub: also observed on Paardeberg, Malmesb. Div. Fl. May—June.

Perhaps doubtful as a separate species for some plants show intermediate characters with the highly polymorphous *O. depressa* E. & Z. It differs from that species in having winged bulbs, often more loosely imbricate leaves on a shortly developed stem and rather narrower petals. The production of numerous aerial bulbils has been noticed in one colony at the summit of Pakhuis Pass (Clanwilliam) in which no trace of flowers could be found in several successive seasons.

*O. squamiflora* Weintroub is a somewhat unnatural form of this species cultivated at the National Bot. Gardens at Kirstenbosch.

- \* 69. *O. oreithala* Salter, sp. nov. *O. Pocockiae* affinis. *Planta* nana, 3—4 cm. alta. *Petioles* ad 1 cm. longi, basi non alati: foliola 1—1.5 mm. longa, 2—2.5 mm. lata, subcarnosa. *Sepala* oblonga obtusa, fere 3 mm. longa, ecallosa. *Corolla* alba, fere 1 cm. longa. *Ovarium* ecallosum, loculis 3-ovulatis.

Dwarf, stemless, slender, 3—4 cm. high. *Bulb* oval, about 7 mm. long, very broadly 4-winged: tunics brown. *Rhizome* 0.5—2 cm. long. *Leaves* 6—8, basal: petioles up to 1 cm. long, sparsely pubescent, scarcely widened at the base: leaflets broadly rotund, entire or sometimes retuse at the apex, 1—1.5 mm. long, 2—2.5 mm. broad, glabrous, rather fleshy, with comparatively large epidermal cells, green above, purple beneath. *Peduncles* 1-fl., 2—3 cm. long, sparsely pubescent, with 2 minute alternate or sub-opposite bracts on the upper part. *Sepals* oblong, obtuse, about 3 mm. long, purplish, ecallose. *Corolla* white, 0.9—1.1 cm. long, with a yellow funnel-shaped tube: petals cuneate, 3.5—4.5 mm. broad, slightly attenuate towards the base, the apex subtruncate. *Filaments* (longistylar form only) 2—3 mm. long, the longer minutely glandular-pilose, dentate. *Ovary* pubescent on the upper half, ecallose, the chambers 3-ovuled: styles 6 mm. long, glandular-pilose: stigmas small, green.

V.R.'s DORP DIV.; Gift Berg, *Leipoldt* (B.H. 22672). Fl. July.

Apparently nearest to *O. Pocockiae* L. Bolus, but in all respects a smaller and more slender plant, differing in the edentate filaments, in the absence of stipule-like wings below the articulation of the petioles, the ecallose sepals and the fewer-ovuled ovary.

70. *O. punctata* L. f. Supp. (1781) 243. Jacq. Oxal. 105, t.66.—*O. calcaria* E. & Z.—*O. favosa* Turcz.—*O. cellulosa* R. Knuth. Dwarf, stemless, slender, often 4—8 cm. high, more or less densely clothed, except on the leaflets, with pluricellular gland-tipped hairs. *Bulb* broadly ovoid, attenuate at the base, often shortly rostrate at the apex, rarely more than 1 cm. long, the tunics hard, sharply and irregularly angled and pitted, or in some forms merely roughly veined, dark brown. *Rhizome* slender, usually short. *Leaves* about 3—10 or rarely numerous: petioles often 1—2 cm. long, the outer usually broadened with stipule-like wings below the basal articulation: leaflets 3, subsessile or shortly petiolulate, the medial widely cuneate-rotund or sub-obdeltoid, somewhat flattened and lightly incised or retuse on the anterior margin, 2—5 mm. long, 3—6 mm. broad, the lateral often smaller, narrower and entire, glabrous, fleshy and impresso-punctate on both faces when dried, ecallose, minutely ciliate with gland-tipped hairs, often livid below. *Peduncles* 1-fl., 2—3 times as long as the leaves, with 2 minute alternate linear bracts on the upper part. *Sepals* narrowly oval, ovate or obovate, obtuse 2—3 mm.



long, glandular-pilose and ciliate, ecallose. Corolla 0.6—1.4 cm. long, glandular-pilose, white or pale violet, with a rather widely funnel-shaped yellow or greenish-yellow tube: petals cuneate, rounded at the apex. *Filaments* minutely glandular-pilose, the shorter 2—3.5 mm., the longer 3—5.5 mm. long, gibbose or edentate. *Ovary* glandular-pilose on the upper half, the chambers 4—6-ovuled: styles minutely glandular. *Capsule* subglobose. Seeds endospermous.

FORM A. (Typical). Small plants: leaves few: bulb sharply angled and pitted.

CAPE PENIN.; *E. & Z.* 730, *Zey.* 236, 246, *MacO.* 1743, *Bolus* 4673, *W-Dod* 1064, 1230, *Schltr.* 722, *Marl.* 668, *B.H.* 14512, 14529, *S.* 244/4, 577, 6583, 8067, 8090: CALEDON DIV.; *Bolus* 1117, *Schltr.* 10299, *B.H.* 15122, 20410, 20443, *S.A.M.* 45925, *S.* 6038, 7205: BREDASDORP DIV.; *Schltr.* 7730: MONTAGU DIV.; *B.H.* 19192. Fl. Apl.—July.

FORM B. Bulb intermediate, scarcely angled.

RIVERSDALE DIV.; *Muir* 2022, *S.* 2372: M. BAY DIV.; *Compton* 5248, *S.* 2349, 2355, 3277: OUDTSHOORN DIV.; *S.A.M.* 54372: UNIONDALE DIV.; *Compton* 5244, 10736, *S.* 3237: UITENHAGE AND P. ELIZ. DIVS.; *E. & Z.* 731 (*O. calcaria* *E. & Z.*), *Paterson* 541, 2707, 2716, *Zey.* 2123: KNYSNA DIV.; *Duthie* 1226: ? loc. *Zey.* 1026, 2104, 2118.

FORM C. Plant larger in all parts, the pluricellular hairs longer. Leaflets often numerous. Bulb roughly veined.

UNIONDALE DIV.; *S.* 6733, *Compton* 5341B: GEORGE DIV.; *Schltr.* 2438, *S.* 3063, 3177, 3181A: ALBANY DIV.; *Daly & Sole* 451: SWELLEN-DAM DIV.; *Bolus* 11234: S. AFRICA; *Kuhn* (*O. cellulosa* *R. Knuth.*).

Possibly the following (without bulbs) should be placed here:—

E. LONDON DIV.; *Flanagan* 2327: Komgha; *Flanagan* 1280.

The angled and pitted bulb of the more westerly (typical) forms does not appear to be a constant character in this species. Roughly speaking, as the plant extends to the eastward, the sharp angles grow less pronounced and closer together, gradually merging into rough veining and in these the tunics very much resemble those of *O. setosa* Sond. and *O. obliquifolia* Rich.

I am unable to find any definite character for the specific separation of *O. cellulosa* *R. Knuth* (Form C.) of which the type, *Kuhn* is labelled South Africa, not German S. W. Africa.

*O. Piottae* Colla, which has been attributed here, is *O. obtusa* Jacq., which also has an angled bulb.

✕ 71. *O. lichenoides* Salter, Journ. of S.A. Bot. II (1936) 50. Dwarf, stemless, glaucous, entirely glabrous, up to 3.5 cm. high. Bulb ovoid or oblong, up to 1.4 cm. long, 5—6 mm. broad, conspicuously winged: tunics elliptical, longitudinally concave, brown, shining, the margins

forming undulate crenate wings. *Rhizome* short, slender, shortly glandular-pilose above, the scales minute, the old bulbs often persisting above the living through the action of the contractile root. *Leaves* numerous: petioles slender, up to 2 cm. long, like the peduncles subpellucid, some-

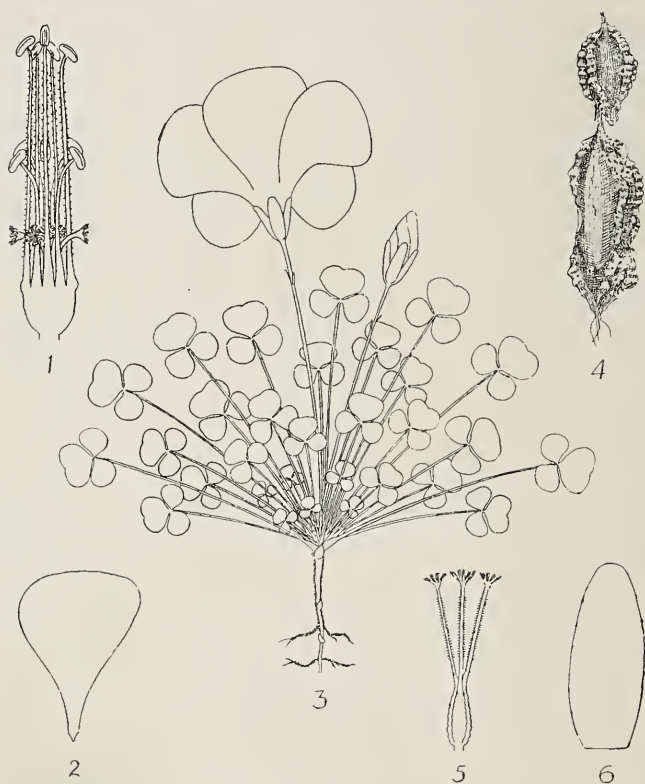


FIG. 21. *Oxalis lichenoides* Salter. 1. Androecium  $\times 6$ . 2. Petal  $\times 2$ . 3. Plant  $\times 2$ . 4. Bulb  $\times 2$ . 5. Gynaecium  $\times 6$ . 6. Sepal  $\times 8$ . (Salter 928.)

times exuding a red sap under pressure: leaflets 3, shortly petiolulate, glaucous, the epidermal cells large, impresso-punctate when dried, the medial broadly rotund, often attenuate at the base, sometimes slightly emarginate or retuse, up to 2.5 mm. long, 3.5 mm. broad, the lateral obliquely suborbicular, smaller and entire. *Peduncles* 1-fl., 1—3 cm. long, longer than the leaves, with 2 small alternate membranous bracts

near the apex. *Sepals* elliptic-oblong or ovate-oblong, obtuse, submembranous, 3—4 mm. long, ecallose. *Corolla* 1.2—1.4 cm. long, white, with a short broadly funnel-shaped yellowish tube: petals very broadly cuneate, attenuate to the base but scarcely clawed, subtruncate at the apex, 6—9 mm. broad. *Filaments*, the longest 7—7.5 mm. long, glandular-pilose, gibbose or edentate, well exerted from the corolla tube. *Ovary* oblong, glabrous or sparsely glandular-pilose, the chambers many-ovuled: styles glabrous below, glandular above, (longistylar form not seen). (Fig. 21.)

V.R.'s. DORP DIV.; one mile south of Bitterfontein, S. 928 (*type* in Bol. Herb.); Knecht's Vlaagte, 10 miles north of Zout River Bridge (old road), S. 5460. Fl. June.

Apparently rare and intermittent in its appearance, for after repeated search in later seasons in the *type* locality, it could not be found again. It usually grows in the shade of small, shrubby plants (especially *Mesembrianthemum*) where it is very difficult to detect unless in flower.

\*72. *O. inaequalis* Weintroub, Journ. of Bot. LXIX (1933) 207. Dwarf, stemless. *Bulb* ovoid, acute at the apex, about 1 cm. long, with smooth brown tunics: numerous aerial bulbils are sometimes produced in the leaf axils. *Leaves* rosulate, often numerous (up to 70): petioles 1—2.5 cm. long, minutely glandular-pilose, dilated below the articulation: leaflets 3, sessile, broadly cuneate-rotund, often about 3 mm. long and 3—4 mm. broad, rather succulent, with large epidermal cells, conspicuously impresso-punctate on both faces when dried, minutely glandular-puberulous above and on the margins, glabrous below. *Peduncles* 1-fl., up to 8 cm. long, but often shorter, minutely glandular-pilose, with 2 minute alternate bracts on the upper half. *Sepals* oblong-lanceolate, subobtusate, glabrous or minutely glandular-pilose, 3—7 mm. long, often very unequal, sometimes with 2 minute calli near the apex. *Corolla* 1.4—2 cm. long, minutely pubescent, yellow or coppery-rose, with a rather short, widely funnel-shaped yellow tube: laminae of the petals cuneate-obovate, often slightly truncate, 2—3 times as long as the tapering claw. *Filaments*, minutely glandular-pilose, the longer (7—11) mm. long, gibbose or scarcely toothed, the longest well exerted from the corolla tube. *Ovary* 2.5—3 mm. long, glandular-pilose on the upper half, with elongate reddish calli near the apex, the chambers many-ovuled: styles glandular-pilose.

CERES DIV.; near Karroo Poort, *Leipoldt* (Nat. Bot. Gar., Kirstenbosch 1457/30, not 1475/30, *Leipoldt* (S. 1339, cult.): LAINGSBURG DIV.; Whitehill, *Compton* (S. 2679, cult.). Fl. July—Aug.

Known from *O. bullulata* Salter by its comparatively smooth bulb tunics and longer, more exerted stamens and styles.

72 *bonapartea*

73. *O. bullulata* Salter, Journ. of S.A. Bot. II (1936) 49. Small, stemless, almost glabrous, 2.5 cm. high or rarely higher. *Bulb* oval or subglobose, acute at the base and apex, slightly angled, up to 1.4 cm. long, with rough puckered brown tunics. *Rhizome* 1—3 cm. long. *Leaves* 10—18: petioles 0.5—2 cm. long, slightly widened below the basal articulation, sometimes, like the peduncles sparsely and very minutely glandular-pilose: leaflets 3, sessile, glabrous, the medial

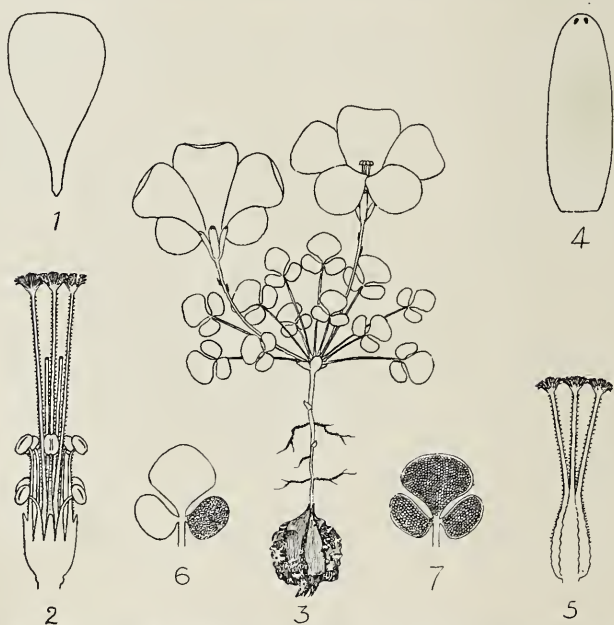


FIG. 22. *Oxalis bullulata* Salter. 1. Petal  $\times 1\frac{1}{2}$ . 2. Androecium  $\times 6$ . 3. Plant and bulb, natural size. 4. Sepal  $\times 6$ . 5. Gynaecium  $\times 6$ . 6. A leaf, under side  $\times 2$ . 7. A leaf, upper side  $\times 2$ . (Salter 5552.)

rotund, broadly cuneate-attenuate at the base, 2—7 mm. long and broad, the lateral obliquely rotund, smaller, the epidermal cells large, distinctly impresso-punctate on both faces when dried. *Peduncles* 1-fl., 1—3 cm. long, longer than the leaves, with 2 minute alternate bracts on the upper half. *Sepals* 4—6.5 mm. long, oblong or oblong-lanceolate, obtuse, submembranous, glabrous, with 2—4 small apical calli. *Corolla* 1.5—2.5 cm. long, yellow, with a short broadly funnel-shaped concolorous tube: laminae of the petals broadly cuneate-obovate,



subtruncate, 0·8—1·2 cm. broad, attenuate to a short claw. *Filaments*, the shorter 2·2—4·5 mm., the longer 3·5—7 mm. long, glandular-pilose, in the medio-stylar form edentate, in the others shortly toothed, the longest (or styles) exerted from the corolla tube. *Ovary* glandular-pilose on the upper half, ecallose. *Capsule* about 4 mm. long. Seeds endospermous. (Fig. 22.)

NAMAQUALAND; 10 miles north of Steinkopf, *S. 5552* (type in Bol. Herb.): V.R's. DORP Div.; 11 miles south of Nieuwerust, *S. 2513*, 3387, 5462, Vlermuisklip, *S. 968*: S.W. AFRICA; Buchurberge, *Dinter 6372* (*O. parvicornis* M.S.). Fl. June—July.

The plants from Steinkopf area are considerably larger than the others in all parts.

✧ 74. *O. Fergusoniae* Salter, Journ. of S.A. Bot. III (1937) 96. Dwarf, stemless, glandular. *Bulb* small, narrow-ovoid, beaked at the apex, sometimes tortuous, usually longitudinally ridged, with rough blackish-brown tunics: bulbils often aerial, very numerous, pale, clustered in the leaf-axils. *Rhizome* short. *Leaves* few, imbricate rather than rosulate: petioles 2—8 mm. long, rarely longer, sparsely glandular-pilose, broadly dilated below the basal articulation: leaflets 3, sessile, rotund, with black calli along the anterior margin, glandular-ciliate, with large epidermal cells, conspicuously impresso-punctate on both faces when dried, the medial 1—2·5 mm. long, 1—3 mm. broad, sometimes slightly retuse at the apex, the lateral oblique, a little smaller. *Peduncles* 1-fl., usually 3—6 cm. long, clothed with short pluricellular capitate hairs, with 2 minute distant alternate bracts on the upper part. *Sepals* oblong, acute, 2·5—4 mm. long, glandular-pilose and ciliate, with 2 conspicuous red converging apical calli. *Corolla* 1·5—1·7 cm. long, rose or white, with a rather widely funnel-shaped yellow tube: petals cuneate, slightly attenuate to the base, rounded at the apex, 7—8 mm. broad, glandular-pilose and ciliate on the outer margin. *Filaments*, the shorter 2·5—4·5 mm., the longer 4—6·5 mm. long, sparsely glandular-pilose, shortly toothed. *Ovary*, on the upper half, like the styles densely pluricellular-pilose, the chambers about 8-ovuled. (Fig. 23.)

RIVERSDALE; *E. Ferguson* (B.H. 20176, type). 19204: UNIONDALE Div.; Ongelegen, *Fourcade 5037*: CERES Div.; Rozendal (Cold Bokkeveld), *Acock 2222*, Theronberg, *Barker 1072*, rather larger in all parts than the typical form. Fl. Sep.—Oct.

The production of acrial bulbils does not seem to be a constant character.

✧ 75. *O. grammopetala* Sond., Fl. Cap. I (1860) 335. Dwarf, stemless, weak, 1·5—4 cm. high. *Bulb* ovoid or sometimes lanceolate in outline, acute at the apex, angular, about 2 cm. long: tunics calyptrately joined,

imbricating, conspicuously pinnate-nerved, beaked at the base, brown. *Rhizome* very slender, 1—6 cm. long. *Leaves* 3—6, spreading: petioles 1—3 cm. long, like the peduncles pale and very minutely glandular-viscid, broadly dilated below the articulation: leaflets 3, sessile, broadly obcordate, cuneate or attenuate at the base, from minute to 4.5 mm. long and 6 mm. broad, glabrous, rather succulent, with large epidermal

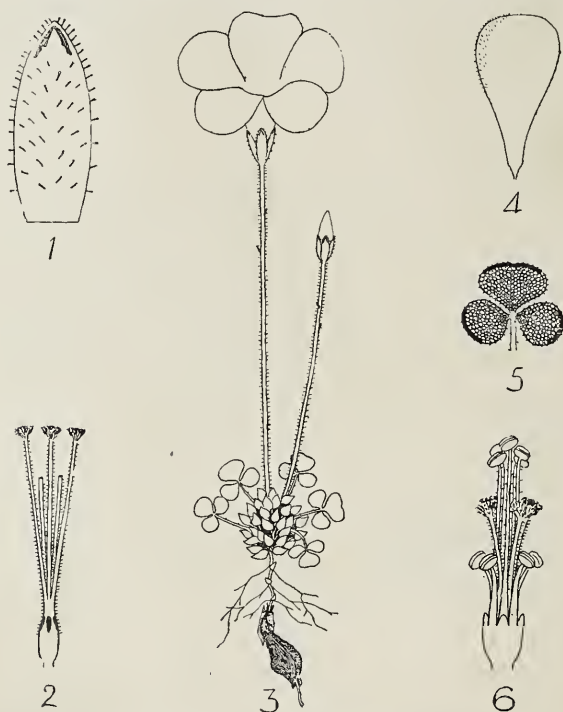


FIG. 23. *Oxalis Fergusonae*, Salter. 1. Sepal  $\times 8$ . 2. Gynaecium  $\times 5$ . 3. *Bolus*  $\times 1\frac{1}{2}$ . 4. Petal  $\times 1\frac{1}{2}$ . 5. Leaf (dry)  $\times 4$ . 6. Androecium  $\times 5$ . (Plant Herb. 20176.)

cells, the mid-rib conspicuous, impresso-punctate on both faces (very irregularly on the scurfy lower surface) when dried. *Peduncles* 1-flid., 1—10 mm. long, with 2 alternate narrow-lanceolate membranous bracts below the middle. *Sepals* ovate, membranous, glabrous, 3—4 mm. long. *Corolla* 1.5—3.8 cm. long, pale straw-coloured, netted-striate with fine purple veins, with a rather narrowly funnel-shaped concolorous tube.

*Filaments* glabrous, the longest from 7—8.5 mm. long, acutely toothed, recurved at the apex. *Ovary* subglobose, 1.5 mm. long, glandular-puberulous on the upper half, the chambers several-ovuled: styles glandular-pilose. *Capsule* globular.

PRINCE ALBERT DIV.; Gamka River, *Burke & Zey.* 266 (*type*), *Zey.* 245 ex pte. (in S.A. Mus.): NAMAQUALAND; *S.* 877, 900, 2572, 4581, 5525: CALVINIA DIV.; *S.* 4459. Fl. May—July.

Remarkable for the variation in the size of the corolla, the variation in the length of the filaments being proportionately very much less. It grows in sand with the petioles and usually the tube of the corolla buried and for this reason the whole plant, with the exception of the leaflets, is pallid. The bulb described by Sonder as "minute, ovate, smooth" is a young bulbil. The mature bulb is unlike that of any other species. The hooded tunics split pinnately and the netted structure may be likened to a cone formed of laterally joined herring bones.

76. *O. algoensis* E. & Z., Enum I (1836) 90, No. 704.—*O. collina* E. & Z. Small, stemless, 4—12 cm. high, hirsute on the herbaceous parts. *Bulb* ovoid, attenuate, up to 2 cm. long, with rather hard brown imbricating tunics. *Leaves* usually 6—12: petioles often 2—5 cm. long: leaflets 3, sessile, rather thick, with a narrow cartilaginous margin, glabrous above, hirsute below, ciliate, impresso-punctate on both faces and sometimes undulate on the margin when dried, the medial oblan-ceolate, elliptic-oblong, obscurely rhomboid, obovate or rotund, always tapering cuneately at the base, 0.7—3 cm. long, the lateral from obliquely oblong to obliquely rotund, rather smaller. *Peduncles* 1-fl., rather longer than the leaves, usually alternately bibracteate near the calyx. *Sepals* lanceolate, 6—9 mm. long, densely hirsute, often purpur-escient on the margins. *Corolla* up to 2.3 cm. long, violaceous, lilac or white, with a funnel-shaped yellow tube: petals subcuneate, slightly attenuate into a claw, 6—9 mm. broad, with an acute point at the apex. *Filaments* glandular-pilose, the longer with rather long subacute teeth. *Ovary* glabrous or glandular on the upper half, with vermilion calli at the apex, the chambers several-ovuled: styles pilose with long simple and short glandular hairs admixed. Seeds endospermous.

UITENHAGE AND P. ELIZ. DIVS.; *E. & Z.* 704 (*type*), *E. & Z.* 710 (*O. collina* E. & Z.), *E. & Z.* 713 (*O. depressa* E. & Z., ex pte.), *Zey.* 133 ex pte., *Paterson* 663, 2270, 2308, 2309, 3142, 3168, 3170, 3171, *Kensit* 1, *Holland* 3580, 3587, 3627, *Long* 471, *Zey.* 2108, *Daly* 1093, *B.H.* 19789: LADISMITH DIV.; *Compton* 4030: ALBANY DIV.; *Cruden* 307, *Dyer* 549. Fl. June—Sep.

The great range of variation in the shape of the leaflets shows that the retention of *O. collina*, even as a variety, is not warranted. The under-

side of the leaflet is not *tomentose* as described by Sonder, although at first sight it has that appearance owing to the hairs overlying the rough collapsed cells.

- ✕ 77. *O. Fourcadei* Salter, Journ. of S.A. Bot. II (1936) 52. Stemless or with a short stem, hirsute, 4—6 cm. high. *Bulb* oval, attenuate at the base and apex, up to 2 cm. long, the outer tunics attenuate-acute, rigid, greyish brown, the inner brown. *Rhizome* 0.5—2.5 cm. long, hirsute in the upper part. *Stem* none or up to 0.5 cm. long, with 2—3 hirsute ciliate amplexicaul scales up to 9 mm. long. *Leaves* 2—8, ascending: petioles 1—2 cm. long, densely hirsute: leaflets 3, sessile, linear or narrow-oblong, 1—2.5 cm. long, 2—4 mm. broad, obtuse, the lateral slightly oblique, involute, ciliate, with numerous small orange dots, which turn black in drying, along the margins, hairy on both faces, smooth above, slightly impresso-punctate and often purple beneath and densely hirsute on the median nerve. *Peduncles* 1-fl., 1.5—3.5 cm. long, hirsute, with 2 linear alternate reddish hirsute bracts towards the calyx, or rarely ebracteate. *Sepals* broadly lanceolate, 6—8 mm. long, hirsute, purple-margined, particularly on the upper half, ecallose. *Corolla* 1.7—2 cm. long, white with a yellow tube: laminae of the petals obovate, about 7 mm. broad, slightly acute at the apex, with a few orange calli: claw slightly attenuate. *Filaments* pilose or almost glabrous, the shorter 2 mm., the longer 3—4.5 mm. long, shortly toothed. *Ovary* pilose on the upper half, with 10 oblong calli towards the apex, the chambers 8—9 ovuled: styles more or less pilose. Brevistylar form not seen. Seeds endospermous.

UNIONDALE DIV.; Kammanassie Hills, 8 miles west of Avontuur, 3100 ft., *Fourcade* 5063 (*type* in Herb. Kew.). Fl. Oct.

Although the leaflets are without the characteristic large epidermal cells of this Section, the seeds are endospermous and it is evidently a close affinity of the foregoing species.

78. *O. Lawsonii* Bolus f., Ann. Bol. Herb. II (1918) 22.—*O. Seineri* R. Knuth. Small, 4—5 cm. high, rather densely villosa-pubescent with whitish hairs, the stem not or rarely scarcely exerted. *Bulb* tunics, the outer linear, dark brown, undulate, crispate and interwoven, the inner papyraceous, lanceolate or ligulate, up to 3.5 cm. long, paler brown. *Rhizome* very long, up to 65 cm. or more, with nerved membranous semi-amplexicaul scales 0.5—1.2 cm. long. *Leaves* 15—40, rosulate or rarely closely imbricate on a short stem: petioles often 3—5 cm. long, dilated, squamiform and 3-nerved below the basal articulation: leaflets 3, very shortly petiolulate, ovate-orbicular, somewhat truncate and broadly incised at the apex, conduplicate-falcate, glabrous above, pilose especially on the medial nerve beneath, impresso-punctate when dried, the medial 0.6—1.4 cm. long, 0.5—1.1 cm. broad, the lateral rather smaller,



slightly oblique. *Peduncles* 1-fld., rather shorter than the leaves, with 2 small alternate bracts rather above the middle. *Sepals* more or less broadly lanceolate, 7 mm. long, densely adpresso-pubescent, ecallose. *Corolla* 1·8—2·5 cm. long, sparsely pubescent, rosy, with a funnel-shaped yellow tube. *Filaments*, the longer 5·5—9 mm. long, sometimes sparsely glandular-pilose, edentate. *Ovary* pilose at the apex, the chambers 2-ovuled : styles densely glandular-pilose. *Capsule* subglobose. Seeds endospermous.

GRIQUALAND W. ; Danielskuil, *Lawson* (B.H. 13378, *type*) ; Bermoli, *Wilman* 2261 ; B.H. 15887 ; Lupane, *S.A.M.* 53374, *Rogers* (B.H. 12565), B.H. 15915, *McGregor Mus.* 3049, *Anderson* 685, *Acock* 326, 327, *Orpen* 216, *Marl.* 9364, *Pole Evans* 2129, *Cook* : Prieska ; *Bryant J.* 268 : BECHUANALAND ; *Esterhuysen* (S. 8058) ; *S.A.M.* 53372 : S.W. AFRICA ; Owinauanaua (Omaheke), *Seiner* 439 (*O. Seineri* R. Knuth. Fl. Feb.—April.

The occurrence of this species in S.W. Africa suggests that it may occur right across Bechuanaland. It has not flowered in cultivation in the Cape Peninsula and I am unable to give the shape of the petals.

✱ 79. *O. Nortieri* Salter, Journ. of S.A. Bot. IV (1938) 112. Stemless, heterophyllous, up to 9 cm. high. *Bulb* ovoid or subfusiform, up to 2·5 cm. long, with hard smooth black tunics. *Rhizome* about 4 cm. long. *Leaves*, the younger first produced by the bulbils trifoliolate, with terete petioles, the later simple, but all simple from the second season : petioles in the mature plant somewhat flattened, 2—6 cm. long : leaflets at first rotund ; lamina in the mature plant more or less elliptical or obovate, subtruncate at the base, thick, 2·5—3·5 cm. long, 1·2—1·8 cm. broad, glabrous or hirsute, impresso-punctate on both faces when dried, the medial nerve conspicuous. *Peduncles* 1-fld., about as long as the petioles, with 2 alternate subulate bracts above the middle. *Sepals* broadly lanceolate, pale, 7—8 mm. long, minutely penicillate. *Corolla* about 1·7 cm. long, rosy-purple, with a funnel-shaped yellow tube : petals broadly cuneate, attenuate at the base, but scarcely unguiculate, truncate-retuse at the apex. *Filaments*, the longest 7·5 mm. long, sparsely villose towards the base, very sparsely glandular-pilose above, edentate. *Ovary* glabrous, ecallose, the chambers 10—12-ovuled. (*Brevistylar form only seen*). (Fig. 24).

WILLOWMORE ; *Nortier* B. H. 21532, (*type*) : OUDTSHOORN DIV. ; Little Buffel's Klip, *Taylor* 450 (a form with hirsute leaves). Fl. June.

This species illustrates the process of simplification of the leaves which seems to be taking place in the genus.

80. *O. Annae* Bolus, f., Ann. Bol. Herb. II (1918) 26.—*O. nana* R. Knuth.—*O. bella* R. Knuth.—*O. exigua* Bolus f. (non Phil.).—*O.*

*punctata* L. f., var. *glabrata* Sond. Dwarf, weak, stemless, entirely glabrous or villose with whitish hairs, 2—6 cm. high. Bulb elongate, acute at the apex or lanceolate in outline, contorted, usually 2—3 cm. long, with a long beak, the older often persisting on the rhizome, the splitting tunics

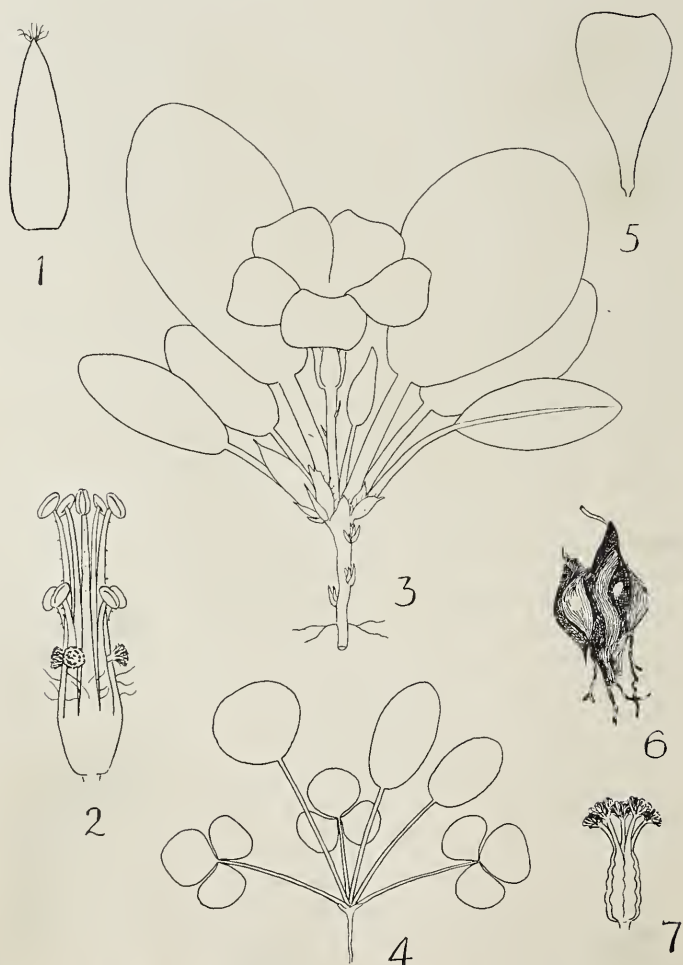


FIG. 24. *Oxalis Nortieri*, Salter. 1. Sepal  $\times 4$ . 2. Androecium  $\times 5$ . 3. Plant  $\times 1\frac{1}{2}$ . 4. Plant produced from bulbil in the first year  $\times 1\frac{1}{2}$ . 5. Petal  $\times 1\frac{1}{2}$ . 6. Bulb, natural size. 7. Gynaecium  $\times 5$ . (B.H. 21532.)

of the upper imbricating the lower through the action of the contractile root. *Rhizome* short, pale. *Leaves* from few to very numerous: petioles usually 1—3 cm. long, broadly dilated and submembranous below the basal articulation: leaflets 3, polymorphic, the medial rotund, widely obcordate, cuneate-obcordate or cuneate-sub-bilobed, the lateral obliquely obovate, oblong-obovate or oblong-cuneate, usually entire, 1—5 mm. long, glabrous or sparsely cano-villose on both faces, impresso-punctate when dried. *Peduncles* 1-fl., 0.5—8 cm. long, shorter or much longer than the leaves, with 2 alternate subulate pale bracts on the upper part. *Sepals* narrow-obovate, broadly lanceolate or oblong-lanceolate, acute or obtuse, 3—5 mm. long. *Corolla* often 1.3—2 cm. long, copper-pink, white or yellow, with a very broadly funnel-shaped yellow tube: laminae of the petals broadly cuneate, obliquely truncate, 3 times as long as the claw, sometimes purple-maculate and cano-pubescent on the outer margin. *Filaments*, the shorter 2—4 mm., the longer 3.5—7 mm. long, more or less minutely glandular-pilose, edentate, the longest well exerted from the corolla tube. *Ovary* glabrous or pubescent on the upper half, the chambers many-ovuled: styles minutely glandular-pilose on the upper half. Seeds endospermous.

FORM A. Corolla copper-pink. PRINCE ALBERT DIV.; *Tugwell* (B.H. 13380, not 13379, type in Bol. Herb.), *Marl.* 11294, *Krige*: CERES DIV.; *Marl.* 10524, *S.* 2645, 3462: CALVINIA DIV.; *Marl.* 12875: NAMAQUALAND; *Compton* 5514: C.b.s.; *Krebs* (*O. nana* R. Knuth.) Fl. June—Aug.

FORM B. Corolla white. V.R.'s DORP DIV.; near Zout Riv., *Schltr.* 8106 (*O. bella* R. Knuth, *O. exigua* Bolus f.), Hollrivier, *Drège* (*O. punctata* L. f., var. *glabrata* Sond.), *S.* 2502, 2511, 2521, 5459, 5494: NAMAQUALAND; near Garies, *S.* 2525, 2528, 3396, 5601, 6654, 6660, Bowiesdorp, *L. Bolus* (B.H. 19194): BRITSTOWN, *B.H.* 15142.

FORM C. Corolla yellow. LADISMITH DIV.; Huis Riv. Pass, *Marl.* 12147.

Widely distributed in the dry parts of the South Western area. In many forms, perhaps all, the earlier leaflets are shorter, more rotund and less distinctly cuneate than the later, a heterophyllous development which has misled previous authors into multiplication of species. Although the plants with white flowers are often inclined to be more glabrous than the others, this character is not sufficiently definite to warrant their separation. The colour of the corolla in the typical form as originally described, viz. "purpurea", seems to have been assumed from dried specimens.

81. *O. senecta* Salter, Journ. of S.A. Bot. II (1936) 16. Small, stemless, hoary, tufted, densely cano-villose. *Bulbs* congested, surround-

ed by a mass of loose tunics : tunics papery, shining, blackish brown, the outer lanceolate, needle-pointed at the apex, splitting in the lower half, the inner paler and thinner. *Rhizome* short, slender. *Leaves* 9—15 : petioles 1—2.5 cm. long, dilated and squamiform below the basal articulation : leaflets 3, petiolulate, thin, cuneate,  $1/5$ — $1/6$ -incised, at the apex, usually conduplicate, glabrous above or cano-villose on both faces, ciliate, glaucous-grey, impresso-punctate when dried, the medial 4—6 mm. long, 2.5—3.5 mm. broad, the lateral oblique, a little smaller. *Peduncles* 1-fl., 2—3 cm. long, densely and retrorsely villose at the apex, with 2 alternate linear villose bracts a little below the calyx. *Sepals* broadly lanceolate or ovate-lanceolate, 4—6 mm. long, ciliate, ecallose. *Corolla* 1.4—1.6 cm. long, white, with a short broadly funnel-shaped yellow tube : laminae of the petals broadly cuneate-obovate, obliquely subtruncate at the apex, densely cano-pilose and rarely purple dotted on the outer margin beneath, about 3 times as long as the tapering claw. *Filaments*, the shorter 2.5—4.5 mm., the longer 4—7 mm. long, minutely glandular-pilose, slightly gibbose. *Ovary* oblong, 1.5—2 mm. long, cano-pilose on the upper half, ecallose, the chambers about 24-ovuled : styles sparsely pilose below, minutely glandular above. Seeds endospermous. (Fig. 25).

V.R.'s DORP DRV. ; Knecht's Vlaagte, 12 miles north of Zout River Bridge (old road) on sandy banks of a dry watercourse, *S.* 5490 (*type* in Bolus. Herb.), 2510. Fl. June—July.

An affinity of both the foregoing and the following species. It appears to be very local, the plants being confined to a small area and it evidently lies dormant, without even producing leaves, unless it receives favourable rains. After its first discovery in 1932, there was no trace of it in the same locality during the two following seasons, though, after good rains, it appeared again in 1935.

\* 82. *O. densa* N.E. Br., Kew Bull. (1906) 101. Dwarf, stemless, glaucous, tufted, densely villous, 2—4 cm. high. *Bulb* elongate, up to 7 cm. long, 2.5 cm. broad : tunics, the outer lanceolate or linear-lanceolate, sharply acute, brown, with 3 conspicuous dark nerves, soon splitting from the base, the inner linear, pale brown. *Rhizome* slender, often 8—10 cm. long, rarely bifurcate, with a few small membranous scales. *Leaves* numerous, densely congested : petioles 1—2 cm. long, scale-like, membranous and 3-nerved below the basal articulation, densely villose with patent hairs : leaflets 3, subsessile, 4—6 mm. long, cuneate-attenuate at the base, bilobed to about the middle, the lobes linear-oblong, divergent glabrous above, villose beneath, glaucous, minutely impresso-punctate when dried, the juvenile leaflets obcordate. *Peduncles* 1-fl., up to 2 cm. long, villose, the articulation often 7 mm. from the base : bracts 2,



filiform, towards the apex. *Sepals* broadly lanceolate, 3—3.5 mm. long, villosa-pubescent, ciliate, sometimes purple-dotted or lined. *Corolla*

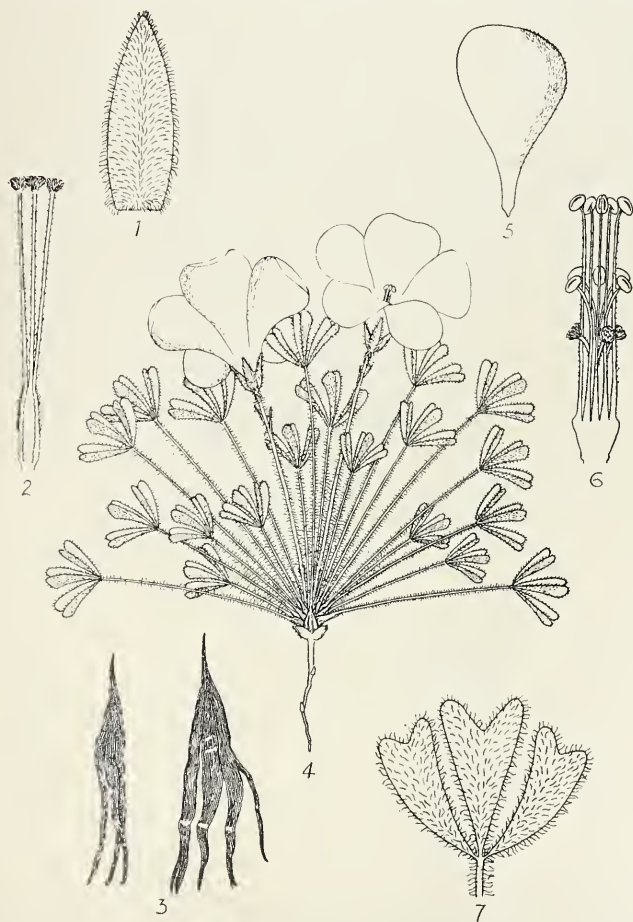


FIG. 25. *Oxalis senecta* Salter. 1. Sepal  $\times 6$ . 2. Gynaecium  $\times 6$ . 3. Bulb, tunics, natural size. 4. Plant  $\times 1\frac{1}{2}$ . 5. Petal  $\times 2$ . 6. Androecium  $\times 6$ . 7. Leaf  $\times 4$ . (Salter 5490.)

0.9—1.6 cm. long, white, with a short broadly funnel-shaped pubescent yellow tube: petals cuneate, subtruncate, pubescent and purple-dotted

along the outer margin beneath. *Filaments*, the shorter 2—3.5 mm., the longer 3.5—6 mm. long, minutely glandular-pilose, slightly gibbose,

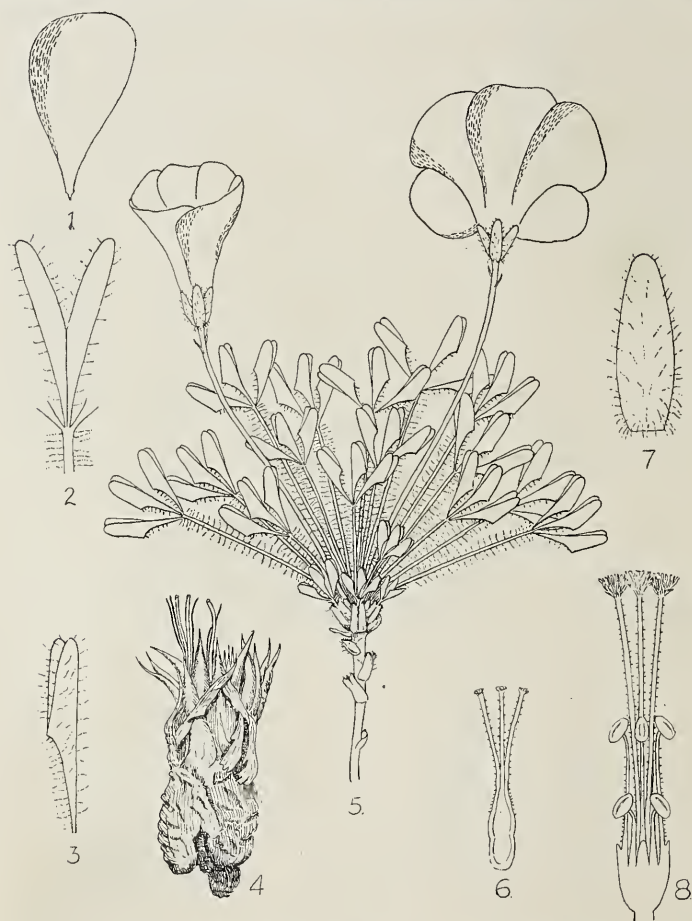


FIG. 26. *Oxalis furcillata* Salter. 1. Petal  $\times 1\frac{1}{2}$ . 2. Medial leaflet, upper side (open)  $\times 3$ . 3. Ditto, under side  $\times 3$ . 4. Bulb cluster, natural size. 5. Plant  $\times 1\frac{1}{2}$ . 6. Gynaecium  $\times 8$ . 7. Sepal  $\times 6$ . 8. Androecium  $\times 8$ . (Salter 2576.)

the longest exserted from the corolla tube. *Ovary* more or less pilose on the upper half, ecallose, the chambers about 12-ovuled: styles glandular or pubescent. Seeds endospermous.

CALVINIA Div.; Brand Vlei, *Johannsen* 9 (*type*), 22 miles north of Downes, *S.* 4456, *Marl.* 10211. Fl. May—Aug.

Closely related to the foregoing, but differing in its bulb and bifurcate leaflets. The first leaflets produced from the bulbils are obcordate. \*83. *O. fureillata* Salter, *Journ. of S.A. Bot.* I (1935) 111. Small, somewhat glaucous, 6—8 cm. high, clothed with long patent hyaline pluricellular hairs, stemless or rarely with a short, sometimes branching stem up to 1 cm. long. *Bulbs* oblong-ovoid, up to 3 cm. long, often congested: tunics thin, rough, brown, undulate towards the base. *Rhizome* up to 15 cm. long, rarely with minute viscous hairs. *Leaves* often very numerous, basal or densely imbricate on a short stem: petioles up to 2 cm. long, rather densely pilose, the outer shorter or scale-like: leaflets 3, sessile, subglaucous, cuneate at the base, bilobed to about the middle, 8—12 mm. long, glabrous above, densely or sparsely ciliate, pilose beneath, particularly on the medial nerve, the lobes linear-oblong, sub-obtuse. *Peduncles* 1-fl'd., often numerous, 2.5—3.5 cm. long, glabrous, with 2 linear alternate bracts towards the apex. *Sepals* narrowly ovate or oblong, obtuse, 4—5 mm. long, pilose, ecallose, sometimes with a few small purple striae. *Corolla* glabrous, 1.6—2 cm. long, white (often very pale yellow when dried), with a short broadly funnel-shaped yellow tube: petals broadly cuneate, obliquely truncate at the apex, 0.9—1.2 cm. broad, often purple-streaked towards the outer margin beneath. *Filaments*, the shorter 2.5—4 mm., the longer 3.5—7 mm. long, glandular-pilose, shortly and obtusely toothed. *Ovary* glandular-pilose on the upper part, the chambers 2-ovuled: styles glandular-pilose. *Capsule* globular. Seeds without endosperm. (Fig. 26.)

NAMAQUALAND; Misklip, *S.* 2576 (*type* in Bol. Herb.); Steinkopf area, *S.* 2593; Concordia area, *S.* 4580, 5538. Fl. June—July.

Var. *β caulescens* Salter, i.e. *Stem* well exerted, pilose, rarely branching. *Petioles* very short, the leaves somewhat tufted. *Peduncles* often cauline.

NAMAQUALAND; about Kamieskroon, *S.* 854 (*type* in Bol. Herb.), 890, 1412, 1484, 2559, 4570, 4607, 5571: Kamiesberg, between Garies and Leliefontein, *S.* 6674.

A species of doubtful affinity. The typical form, though larger, closely resembles the foregoing species, but the exendospermous seeds should really exclude it from this Section. In cultivation var. *β* has produced a lax leafy stem with manifestly cauline peduncles, showing to some extent the habit of *§ Sessilifolia*<sup>var.</sup>, where in spite of its petiolate leaves and dissimilar habit, it should, perhaps, be placed.

## Sect. G. SAGITTATAE.

Stamens and styles very slender, the short and medium organs, whether stamens or styles, spreading widely on release from the corolla tube, the longest organs remaining erect. Anthers sagittate. Corolla tube subcylindrical or very narrowly funnel-shaped. Bulbs usually not deep, the tunics often pale brown. Stemless plants. Leaflets 3, variable in shape, subentire. Seeds without endosperm. (*Sp.* 84—88).

A very distinct natural section, easily distinguished in the living state by the characters of the gynaecium and androecium. (See Introduction, Part XII (ix) The Stamens and Fig. 3).

The section consists, with a few exceptions, of a vast number of closely related microspecies, many of which are now brought together under the group-species *O. Eckloniana* Presl., and includes plants from the former sub-sections Angustatae (Oblongae) and Rotundatae (Purpureae and Luteolae).

(See Group 4 of *Analysis of the Species*).

84. *O. fibrosa* Bolus f., Ann. of Bol. Herb. II (1918) 20. Stemless, up to 7 cm. high, or larger in shade forms, clothed with viscous pluricellular hairs. *Bulb* narrow-ovoid or the younger lanceolate in outline, with a long slender tapering curved beak: tunics black or dark brown, smooth, needle-pointed, the older often imbricating on the rhizome through the action of the contractile root. *Rhizomes* glandular-pilose on the upper part, the old dead ones persisting and numerous, at times forming a somewhat fibrous mass. *Leaves* 7—35, basal or in shade forms imbricating on a very short stem: petioles up to 2.5 cm. long: leaflets 3, the medial shortly petiolulate, cuneate-obovate, 5—6 mm. long and broad, the lateral sessile, oblique, sparsely pluricellular-pilose on both faces, ciliate with pluricellular, capitate or long simple hairs. *Peduncles* 1—3 cm. long, ebracteate or with one or two minute bracts below the middle. *Sepals* ovate-lanceolate, acute, 3—4 mm. long, ciliate, ecallose, usually more or less purple-margined. *Corolla* 2—3.5 cm. long, glandular-pilose, pale lilac, with a subcylindrical yellow tube: petals very thin and fugitive, the laminae obliquely narrow-obovate, as long as the claw, rarely dotted with purple calli on the outer margin. *Filaments*, the shorter 5.5—8 mm., spreading, the longer 7—11 mm. long, sparsely glandular-pilose on the lower half, shortly toothed near the base, spreading in the longistylar form: anthers subsagittate. *Ovary* shortly glandular-pilose on the upper half, the chambers 1—2-ovuled: styles pubescent below, glabrous above, spreading except in the longistylar form. Seeds without endosperm.

WORCESTER DIV.; near Matjesfontein, *F. Bolus* (B.H. 13379—



type), Hex River Pass, S. 2187, 2196, 6048; LAINGSBURG DIV.; Whitehill, B.H. 21958 *Compton* 3957; MONTAGU; S. 1052, 2331, 3106; LADISMITH DIV.; in and near Seven Weeks Poort, S. 3121, 3122. Fl. April—June.

This species was originally described from very much dwarfed and quite abnormal dried specimens evidently gathered in a very dry season, but the normal form has been described above. It appears that the masses of old dead rhizomes, which have a somewhat fibrous appearance, were taken for bulb tunics (see original description), for the tunics are smooth and entire.

\*85. *O. microdonta* Salter, Journ. of S.A. Bot. II (1936) 151. Stemless, up to 8 cm. high. *Bulb* narrow-oval, attenuate at the base and apex, scarcely 2 cm. long, with rather hard blackish-brown tunics. *Rhizome* up to 20 cm. long, tortuous, with a thin brown cortex. *Leaves* 2—5: petioles slender, reddish-brown, 2—3 cm. long, very sparsely pilose: leaflets 3, sessile, linear-oblong or elliptic-oblong, 2.5—2.8 cm. long, 3—4.5 mm. broad, obtuse, minutely emarginate, denticulate, ciliate with somewhat hyaline patent or inflexed bristly hairs. *Peduncles* 1-flid., 3—5 cm. long, with 2 alternate subulate bracts towards the apex. *Sepals* lanceolate, 6—7 mm. long, sparsely hirsute, ciliate. *Corolla* 2—2.6 cm. long, glabrous, violaceous, with a subcylindrical yellow tube: laminae of the petals obliquely obovate, up to 9.5 mm. broad, as long as the narrow claw. *Filaments* (brevistylar form only seen), the shorter 6 mm. long, spreading, the longer about the same length, unequal, erect, glandular-pilose: anthers sagittate. *Ovary* villose on the upper half, the chambers 4—5-ovuled: styles (*short*) spreading. Seeds without endosperm. (Fig. 27.)

MONTAGU DIV.; in shade of bushes near Montagu, S. 2318 (*type* in Bol. Herb.), 1047 (cult.). Fl. May.

Distinguished from the forms of *O. Eckloniana* Presl. var. *Sonderi* with oblong leaflets by the long rhizome and very different bulb.

86. *O. nidulans* E. & Z., Enum. I (1836) 92 no. 724—*O. denticulata* W-Dod (pars alba).—*O. purpurea* Th., var. *simulans* R. Knuth.—*O. Schlechteri* Schinz ex R. Knuth.—*O. promontorii* R. Knuth. Rather small, stemless, usually 5—8 cm. high. *Bulb* ovoid, acute at the apex, rarely exceeding 1 cm. in length, with rather soft lightish brown tunics: bulbils produced terminally on long slender underground stolons arising from the upper part of the rhizome. *Rhizome* slender, pale, with a few minute scales. *Leaves* few or many: petioles often 1.5—3 cm. long, glabrous or very sparsely villose: leaflets 3, very shortly petiolulate, more or less rotund, suborbicular emarginate, or broadly subobcordate, lightly incised, 0.5—1.3 cm. long and broad, glabrous above, rarely pilose on the medial

nerve beneath, denticulately ciliate with rather distant tubercular-based deciduous hairs, concolorous. (*The denticulations tend to disappear after the falling of the caducous hairs.*) Peduncles 1-fl., 2—3 times longer than the leaves, glabrous or very rarely sparsely pilose, with 2 small

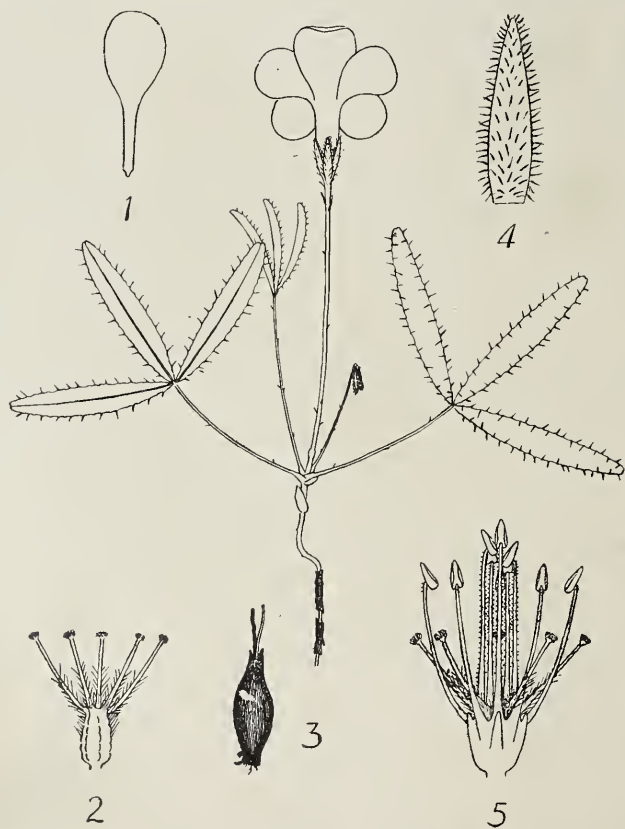


FIG. 27. *Oxalis microdonta*, Salter. 1. Petal, natural size. 2. Gynoecium  $\times 5$ . 3. Plant and bulb, natural size. 4. Sepal  $\times 4$ . 5. Androecium  $\times 5$ . (Salter 1047.)

alternate lanceolate bracts near the calyx. *Sepals* more or less lanceolate, 5—6 mm. long, acute or subobtus, minutely penicillate at the apex, otherwise glabrous, ecallose. *Corolla* 1.8—2.6 cm. long, white or pale rosy-violet, with a funnel-shaped yellow tube: laminae of the petals

obovate, about as long as the claw. *Filaments* slender, the longest up to 7 mm. long, minutely glandular-pilose, toothed near the base, the short and medium (like the styles) spreading: anthers sagittate. *Ovary* truncate at the apex, villose on the upper part, the chambers 4—5-ovuled: styles slender, pilose near the base, the longest only erect; stigmas very small. Seeds without endosperm.

CAPE PENIN.; *E. & Z.* 724 (*O. nidulans* E. & Z., ex pte., type in S.A. Mus.), *Zey.* 2115, W-Dod 1265 *O. denticulata* W-Dod, pars *alba*) 67, 1354, 2510, *Schltr.* 1023 (*O. Schlechteri* R. Knuth), *Wilms* 3077 (*O. promontorii* R. Knuth), *S.* 243/20, 244/1, 1003, 1360, 3564, 3565, 6139, 6158, 6161, 8166: STELLENBOSCH DIV.; *Parker* 3676: MALMESB. DIV.; *S.* 1039: PAARL DIV.; *S.* 6693: TULBAGH DIV.; *B.H.* 14808, *S.* 2649, 2651: CLANWM. DIV.; *B.H.* 14623, 18884. Fl. July—Aug., in damp but not marshy places.

The following is intermediate with *O. minuta* Th.:—

CAPE PENIN.; Kenilworth, *L. Bolus* (B.H. 14952).

Var.  $\beta$  *denticulata* (Wolley-Dod) Salter. *Sepals* hirsute. *Corolla* rosy-purple or violaceous, the petals wider and the tube rather more narrowly funnel-shaped than in the typical form.

CAPE PENIN.; W-Dod 1298 (*O. denticulata* W-Dod, pars *rubra*—type in Bol. Herb.), *S.* 989, 997, 1170, 5417, 6156: Paarl Div.; *S.* 3296, 6618: WORCES. DIV.; *B.H.* 22306: CALEDON DIV.; *Zey.* 2112 ex pte., *S.* 2305. Fl. June—July, in dryer situations than the typical form.

The following are intermediate with the typical form:—

PAARL DIV.; *S.* 3442: Caledon Div.; *S.* 2398, 6030, 6176.

Note:—It is possible that some of the specimens of *E. & Z.* 716 (*O. fallax*) may belong here, although all those which I have seen are *O. Eckloniana* Presl., var. *Sonderi*.

Sonder, on the evidence of Zeyher's specimens, attributed this species to *O. purpurea* Sond., non Th., var.  $\gamma$ , but the pure forms show some marked differences and are undoubtedly separable. The typical white form is very closely related to *O. minuta* Th. which, however, does not produce underground stolons.

Although var.  $\beta$  appears to be quite distinct in the Cape Peninsula, intermediates occur further inland and it also seems in some localities to merge into *O. Eckloniana* Presl. var. *Sonderi*. It is possible that hybridisation may have taken place between these closely related plants.

The fact that the long ciliate hairs (swollen at the base) on the denticulations are (? always) deciduous or perhaps sometimes entirely missing and that the denticulations themselves disappear on the older leaflets, has probably deceived previous authors, although there are still very slight traces of them on the specimens *E. & Z.* 724, the type. Both *O.*

*Schlechteri* Schinz ex R. Knuth and *O. promontorii* R. Knuth undoubtedly belong here.

87. *O. minuta* Thunb., Diss. Oxal. (1781) 8, No. 2, t. 2. (Jacq. Oxal. t. 79, f. 2).—*O. littoralis* E. & Z.—*O. pratensis* E. & Z.—*O. minuta* Th., var. *major* Sond. Small, stemless, 5–10 cm. high almost glabrous. *Bulb* ovoid, acute at the apex, up to 1 cm. long, with rather soft roughish brown tunics. *Rhizome* short. *Leaves* usually 2–6, with petioles 1–3 cm. long : leaflets 3, shortly petiolulate, oval, obovate, or oblong, of en 0·7–1·3 cm. long, lightly emarginate, usually falcately conduplicate in open ground, larger, flat and tending to widen in shade, glabrous or more rarely distantly ciliate with longish deciduous hairs on the margins and medial nerve beneath. *Peduncles* few, 1-fl'd., 2–3 times longer than the leaves, with 2 alternate subulate bracts near the calyx. *Sepals* lanceolate, 4–6 mm. long, often reddish, minutely penicillate at the apex. *Corolla* 1·7–2·2 cm. long, white, glabrous, with a narrowly funnel-shaped yellow tube : laminae of the petals obovate, 7–8 mm. broad, sometimes rosy on the outer margin beneath, about as long as the narrow claw. *Filaments*, the shorter 4–5 mm., the longer 5·5–7 mm. long, glabrous or sparsely glandular-pilose, with rather acute teeth near the base, the short and medium (like the styles) spreading : anthers sagittate. *Ovary* callose and slightly pilose near the apex, the chambers 3–5-ovuled : styles glabrous, the longest only erect. *Capsule* not exserted. Seeds without endosperm.

STELLENBOSCH DIV. ; E. & Z. 702 (*O. pratensis* E. & Z.), E. & Z. 703 (*O. littoralis* E. & Z.), Zey. 2115 ex pte., Schltr. 4807, Parker 3680, Duthie 508 : CAPE PENIN. ; W-Dod 1184, 1263, B.H. 14585, Pillans 2535, S. 243/16, 768, 770, 2401, 3363, 6099, 8110 : PAARL DIV. ; near Achter Paarl, S. 3580. Fl. May–July.

*O. tenella* Lodd. Bot. Cab. t. 1096, previously cited as this species, is *O. tenella* Jacq., of which it is a fair illustration.

\* Var. *β callosa* Salter., var. nov. *Folia* satis numerosa : foliola sessilia, oblonga vel linear-oblonga, apice bicallosa. *Sepala* obtusiora, omnino glabra, apice bicallosa.

*Leaves* more numerous : leaflets sessile, oblong or linear-oblong, bicallose at the apex. *Sepals* more obtuse, entirely glabrous, conspicuously bicallose at the apex.

CLANW. DIV. ; Grootkliphuis, in marshy soil, *Leipoldt* (Bolus 9400, type in Bol. Herb.). Fl. Nov.

A somewhat variable species, closely related to the foregoing, usually found in damp places. The deciduous ciliation of the leaflets, which has hitherto distinguished *O. pratensis* E. & Z., is a variable character and in large colonies growing near Kenilworth (Cape Penin.), in which most



specimens have glabrous leaflets, a few are to be found with ciliation near the apex. Some inland colonies are more robust, e.g., *O. pratensis* with ciliate leaflets and notably *S.* 3580, without ciliation.

I have not seen Thunberg's specimens and follow his figure and Sonder's opinion as regards the identity of this species. There is, however, an unexplained discrepancy in Jacquin's figure (t. 79, f. 2), drawn from Thunberg's dried specimen, for the androecium is figured quite incorrectly for the § *Sagittatae* and it is difficult to believe that it has been drawn from pure imagination. Further, I do not understand how this elaborate drawing can have been made from dried material. According to H. O. Juel, Thunberg's specimens are mixed up with those of *O. pusil* a Jacq. and it is conceivable that it was this minute-flowered p'tant that suggested the epithet *minuta* to Thunberg, although his description does not apply to it.

Var. *callosa* is quite distinct and has a different flowering season : possibly it is a separate species. It is, however, only known to me from the dried *type* specimens, which are without bulbs and on account of its close resemblance to *O. minuta*, it seems to be best placed here.

88. *O. Eckloniana* Presl. Bot. Bemerk. (1844) 29. (*A group-species*). *Synonyms are given under the various Forms and varieties.* Stemless, more or less pilose. *Bulb* ovoid, acute at the apex, 1—2 cm. long, with rather light-brown smooth tunics. *Leaves* few or many : petioles 1—3 cm. long, pilose : leaflets 3, sub-rotund, or in vars. oval, elliptical, obovate, oblong or linear-oblong, rarely cuneate-obcordate, emarginate, closely or in vars. distantly ciliate, pilose on the mid-rib beneath, green, concolorous or in vars. often purple beneath. *Peduncles* 1-fld., pilose, usually with 1—2 alternate bracts close to the calyx. *Sepals* lanceolate or linear-lanceolate, sometimes slightly attenuate, 5—9 mm. long, pilose. *Corolla* somewhat hypercrateriform, 1.5—3.5 cm. long, yellow, or in vars. rose-purple, violaceous, orange, salmon, or white with a sub-cylindrical yellow tube : laminae of the petals obliquely and broadly obovate, as long as or shorter than the narrow claw. *Filaments*, the shorter 4—6 mm., the longer 6—8.5 mm. long, glandular-pilose, acutely toothed near the base, the short and medium (like the styles) spreading on release from the corolla tube, the longest erect : anthers sagittate. *Ovary* pilose on the upper half, the chambers 2—5-ovuled : styles slender, pubescent below, glabrous or glandular above, the longest only erect : stigmas very small. Seeds without endosperm.

FORM A. Typical. *Leaves* rather coarsely pilose : leaflets more or less rotund, 0.8—1.5 cm. long and broad, concolorous. *Bracts* 3—6 mm. long. *Corolla* up to 3.3 cm. long (? sulphur) yellow.

CAPE PENIN. : Green Point Common, *Ecklon* 586 (*O. sulphurea*

Ecklon, non Jacq., type), *E. & Z.* 715, *Zey.* 204 (in S.A.M.), *W-Dod* 1082, *MacO.* 1814, *Prior.* Fl. May. Probably now extinct.

FORM B.—*O. salmonicolor* Schltr. *Leaflets* rather broadly obovate or rarely cuneate-obovate, concolorous. *Bracts* minute or more often wanting. *Corolla* yellow or salmon-coloured.

(i) *Leaflets* obovate, more or less equal.

CAPE PENIN.; yellow, *Bolus* 3384, 7103; MALMESB. DIV.; yellow, *Bachmann* 1006, 1806, *S.* 4523, 5993, 8638, *B.H.* 22608, 22609; salmon, *Bachmann* 1058, 1858, 1072, 1872, *Pillans* 6681, *S.* 654, 659, 2419, 3355, 6103; PIQBG. DIV.; *Schltr.* 7906 (*O. salmonicolor* Schltr.), *S.* 383/9, 8153, *B.H.* 20099.

(ii) *Leaflets* cuneate-obovate, the medial longer than the lateral.

MALMESB. DIV.; yellow, *B.H.* 22610.

FORM C. More robust and more coarsely hirsute than the typical form. *Leaves* 7—12: *leaflets* broadly cuneate-rotund, concolorous. *Bracts* up to 3 mm. long or wanting. *Sepals* 6—9 mm. long. *Corolla* 3—3.5 cm. long, rose

CAPE PENIN.; near Pinelands, *L. Bolus* (B.H. 14526), *S.* 6606; CAPE DIV.; Tygerberg, *S.* 566; MALMESB. DIV.; near Kalabas Kraal, *B.H.* 14569, *S.* 6586.

Perhaps only a colour variant of the typical Form A.

Var.  $\beta$  **montigena** (Schltr.) R. Knuth.—*O. purpurea* Th., var. *montigena* R. Knuth. Dwarf. *Leaflets* broadly obcordate, denticulate, ciliate. *Corolla* small, rose-purple or lilaceous, the tube yellow.

CALEDON DIV.; Houw Hoek, *Schltr.* 7565 (type—Berlin), *Guthrie* 2231; CERES DIV.; Martin (Kirstenbosch 714/37); WORCES. DIV.; *Andreae* 316.

The corolla tube is not reddish-purple as described in Pflrch-Ox.

Var.  $\delta$  **hopefieldiana** R. Knuth.—*O. purpurea* Th., var. *Hopefieldiana* R. Knuth.—*O. purpurea* L., var. *aurantiaca* Salter & Exell. A rather small weak plant. *Bulbils* produced on underground stolons. *Corolla* orange or rose-purple.

MALMESB. DIV.; Hopefield, *Bachmann* 1863, 1871 (type—Berlin), *S.* 2409, 3352, 3373, 6015, 6590, 6613, *B.H.* 14552, 14556, 14557; CAPE DIV.; Marloth 642, *S.* 789; CLANW. DIV.; *S.* 383/10 (*O. purpurea* L., var. *aurantiaca*).

\* Var.  $\epsilon$  **robusta** Salter, var. nov. *Planta* robustior, satis rigide hirsuta. *Rhizoma* longius. *Foliola* majora, rotundata vel suborbiculata, 1.1—2 cm. diam., subcoriacea, supra atro-viridia, infra saturate purpurea. *Corolla* parva, ad 2 cm. longa, violacea, tubo brevior, anguste infundibuliforme. *Sepala* 7—8 mm. longa.

More robust, rather coarsely hirsute. Rhizome longer. Leaflets larger, rotund or suborbicular, 1.1—2 cm. diam., subcoriaceous, dark green above, densely purple beneath. Corolla small, up to 2 cm. long violaceous, the tube shorter, narrowly funnel-shaped. Sepals 7—8 mm. long.

PAARL DIV.; Groot Drakenstein, near the War Memorial, *S.* 6617 (*type* in Bol. Herb.): CLANW. DIV.; *F. Bolus* (B.H. 14606, 14614).

Var.  $\zeta$  **Sonderi** Salter.\*—*O. purpurea* Th. (sensu Sond.)—*O. approximata* Sond.—*O. bifolia* E. & Z.—*O. Bolusii* R. Knuth. Leaves 2—many: leaflets subrotund, often broadly cuneate at the base, oval, ovate, elliptical, obovate, oblong-obovate, oblong or linear-oblong, closely or distantly ciliate, 0.5—3 cm. long, often purple beneath. Corolla rose-purple, violaceous, white or rarely orange. A polymorphous group of micro-varieties.

CAPE PENIN.; *E.* & *Z.* 707 (*O. purpurea*—type), 706 (*O. speciosa*), 708 (*O. laxula*), 716 (*O. fallax*), *Zey.* 234, 2113, *Bolus* 4674, *W.-Dod* 1069, *B.H.* 14500, 14505, 14527, 14951, *S.* 536, 542, 567, 572, 622, 623, 1009, 6011, 6101, 8053, 8111: CLANW. DIV.; *E.* & *Z.* 725 (*O. bifolia* E. & Z.), *S.* 2139, 5398, Grey's Pass, *Schltr.* 7934, *B.H.* 14599, *S.* 383/5, 749, 3326, 4429: PIQBG. DIV.; Pietersfontein, *Drège* (*O. approximata* Sond.), *Zey.* 224, *S.* 5432: MALMESB. DIV.; *B.H.* 14563, 14564, *S.* 776, 779, 2405, 3348, 6614, 6615 (orange), *Leipoldt* S.A.M. 48377, 48378, 48379, 48380: WELLINGTON DIV.; *B.H.* 14510, *S.* 373/12, 4348, 5257: PAARL DIV.; *S.* 6598: CAPE DIV.; *S.* 525: STELLENBOSCH DIV.; *Zey.* 2115 ex pte.: CERES DIV.; *B.H.* 19727, 20078, 20445, *S.* 2111, 2176, 2231, 2232, 2284: ROBERTSON DIV.; *B.H.* 22446: WORCES. DIV.; *S.* 2195, 2215, 2309, 5261, 6065: CALEDON DIV.; *Zey.* 2112 ex pte., *Bolus* 1118 (*O. Bolusii* R. Knuth), 7462, *Guthrie* 4156, *Schltr.* 7761, *S.A.M.* 45923, *S.* 605, 1220, 2297, 2299, 2301, 2393, 2394, 6032, 6696, (*S.* 2396 is somewhat intermediate with *O. nidulans* E. & Z., var. *denticulata*): BREDASDORP DIV.; *B.H.* 20437, 20440, 20441, *Schltr.* 7674, *Galpin* 4947: SWELLENDAM DIV.; *S.* 2382, 2386, 2389: M. BAY DIV.; *Muir* 2648, *S.* 2345. Fl. usually May—June.

FORM B. Hairs hyaline-setose. Leaflets densely ciliate with short shining ascending setae, purple beneath. Corolla rose.

WORCES. DIV.; 16 miles south of Worcester, *S.* 2313.

Possibly a distinct variety. The same remarkable ciliation is to be found on the leaflets of *O. adenodes* Sond., Form C.

Var. *humilis* (Th.) R. Knuth. The specimen so labelled in Thunberg's herbarium is the same as var. *Sonderi* above. Thunberg's description

\*For the adoption of this name in the place of *O. purpurea* (Th.) sensu Sond. in Flor. Cap. I. 331, see Journ. of S.A. Bot. V (1939), 50.

of this species, however, applies without doubt to *O. purpurea* L. (See Journ. of S.A. Bot. V (1939) 50).

The problem of dividing up this prolific and polymorphous group of plants into definite taxonomic units appears at present to be insoluble, for except in a few cases, no really constant combinations of the variable characters can be found. The leaflets vary in thickness, ciliation and in shape from broadly rotund to linear-oblong, with almost every possible intermediate shape and although a few forms show a slight tendency to heterophylly, in the great majority of cases the shape of the leaflets in each colony of plants is fairly constant. Neither can the various colours of the corolla nor the relative length of the tube in proportion to the laminae of the petals in any way be correlated with the shape of the leaflets.

The var. *Sonderi* admittedly includes a large number of very variable plants.

#### Sect. H. CAMPANULATAE.

Corolla widely campanulate : teeth on the longer filaments prominent : leaves simple, or trifoliolate with obcordate leaflets : corolla yellow or white. Water or marsh plants. Seeds without endosperm. (*Sp.* 89—92).

A natural section, characterised by the wide open corolla tube. *O. uliginosa*, which follows, also a marsh species, has a broadly funnel-shaped corolla tube, but is evidently most nearly related to this section. (*See groups 2 and 12 in analysis of the species*).

✱ 89. **O. Dregei** Sond., Fl. Cap. I (1860) 318. Stemless. A small sometimes minute entirely glabrous lax marsh plant, 3—8 cm. high. *Bulb* ovoid, acute at the apex, 0.6—1 cm. long, with very few, easily shed brown papery tunics : bulbils produced on short lateral underground runners on the rhizome. *Rhizome* slender, with many lateral rootlets near the apex. *Leaves* 6—12, unifoliolate, basal or loosely imbricate on a very short stem : petioles 0.5—7 cm. long, with membranous alae below the articulation : lamina obreniform-obcordate, rather deeply incised, often conduplicate, thin, 0.4—1.6 cm. long, 0.5—2 cm. broad. *Peduncles* 1-fl., 1.5—8 cm. long, with 2 small pale linear alternate bracts near the calyx. *Sepals* broadly obovate, thin, 2—3 mm. long. *Corolla* campanulate, 0.8—1.5 cm. long, white, with a very broad yellow tube : petals cuneate-obovate, obliquely truncate or retuse, the claw very broad and short. *Filaments* glabrous, the longest 4.5 mm. long, well exerted from the corolla tube, with broad prominent teeth. *Ovary* ovoid, glabrous, the chambers 2-ovuled : styles very sparsely glandular-pilose or glabrous. Seeds without endosperm.

NAMAQUALAND ; Khamiesberg, *Drège* (*O. rostrata* E. Mey. M.S.,



non Jacq.) type in Herb. Sond., *Pearson* 6610, *S.* 859, 3718, 3814, 5537 : CLANW. Div.; *Bolus* 1116, *Schltr.* 8023, *B.H.* 19921, *Pillans* 6670, *S.* 691, 3338, 5615, 6128 : CALVINIA Div.; *B.H.* 19278, 19901 : WORCES. Div.; *Marl.* 10795. Fl. May—Sep.

This species grows in wet marshy places and on stream-banks. The corolla is always white.

90. *O. simplex* Salter, Journ. of S.A. Bot. I (1935) 81. A minute stemless marsh plant, 2—3 cm. high. Bulb ovoid, slightly attenuate

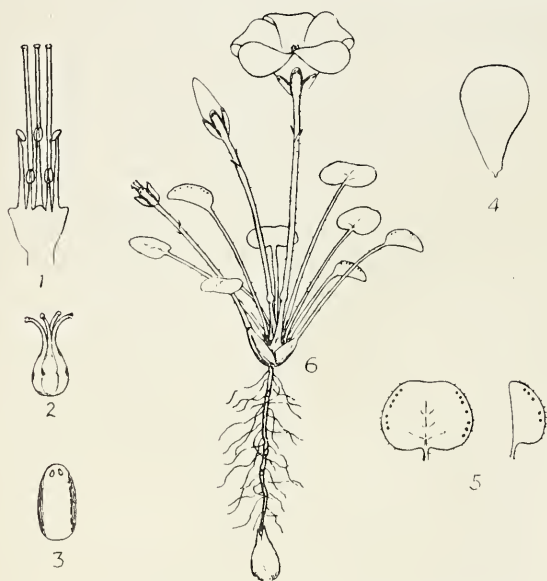


FIG. 28. *Oxalis simplex* Salter. 1. Androecium, showing styles  $\times 8$ . 2. Gynoecium  $\times 8$ . 3. Sepals  $\times 6$ . 4. Petal  $\times 2$ . 5. Leaf, underside  $\times 3$ . 6. Plant  $\times 2$ . (Salter 2464.)

at the apex, up to 5 mm. long : tunics papery, brown. Rhizome 1—4 cm. long. Leaves 6—12, unifoliate : petioles 0.3—2 cm. long, sparsely and minutely glandular-pilose : lamina suborbicular, sometimes slightly retuse at the base and apex, 2—4 mm. long, usually rather wider than long, sparsely and minutely glandular-ciliate, with a row of black calli near the margin beneath. Peduncles 1-fl., 1—2 cm. long, minutely glandular-pilose, with 2 alternate callus-tipped bracts on the upper part. Sepals oblong-elliptical, obtuse, 2—2.5 mm. long, glabrous, with

purple margins and 2 red apical calli. *Corolla* campanulate, 0.9—1.1 cm. long, white or rarely pale rose, with a very broad tube : petals cuneate-obovate, slightly attenuate at the base, 5—6 mm. broad, obscurely veined, tinged with pale rose on the outer margin beneath. *Filaments* glabrous, the shorter 1.5—2.5 mm., the longer 2.5—4 mm. long, prominently gibbose. *Ovary* glabrous, the chambers 1—2-ovuled : styles glabrous. Seeds without endosperm. (Fig. 28)

CLANW. DIV. ; in waterlogged ground near Bandewyns River Causeway, between Pakhuis and Doornbosch, *S.* 2464 (*type* in Bol. Herb.), 3513, Nardouw, *Stokoe* 7726. Fl. July—Aug.

Smaller and less lax in habit than the foregoing, with entire, not bilobed leaves.

91. *O. disticha* Jacq. *Oxal.* (1794) 52, t. 18. An entirely glabrous water plant. *Bulb* oblong-conical, 3—4 cm. long, the outer tunics dark brown, often splitting longitudinally, the inner shining, orange-brown. *Rhizome* 4—8 cm. long, with a tunicaceous cortex. *Stem* submerged, somewhat flexuous, rather thick, up to 40 cm. long, often branching, with large amplexicaul membranous scales on the lower part. *Leaves* often 6—10, cauline, distichous, alternate, the lower distant, the upper somewhat congested : petioles 2—5 cm. long, terete above, amplexicaul, broadly stipule-winged, membranous and scale-like below the articulation : leaflets shortly petiolulate, rather broadly obcordate, not deeply incised 0.6—1.3 cm. long, 0.5—1.2 cm. broad, somewhat cartilaginous at the margin, rather inconspicuously punctate with small brown calli. *Peduncles* 1-fl., erect, axillary on the upper part of the stem, as long or longer than the leaves, with 2 broadly lanceolate bracts imbricating the calyx and about half its length. *Sepals* oblong or ovate-oblong, obtuse, or sometimes emarginate, 5—8 mm. long. *Corolla* 1.8—2.2 cm. long, yellow, with a very broadly campanulate tube : petals very broadly cuneate-obovate, with a very short broad claw, often retuse at the apex. *Filaments* the shorter 2—4 mm., the longer 4—7 mm. long, glabrous or sparsely glandular-pilose, with broad thick rather acute projecting teeth. *Ovary* chambers 1—2 ovuled : styles very sparsely glandular near the base. Seeds without endosperm. (Plate I (ii), opp. p. 48).

PIQBG. DIV. ; in shallow clayey seasonal pools between Pools Siding and Grey's Pass, *S.* 2608, 5619, *Schltr.* 4911, 10746, *Leipoldt* (B.H. 19767), 3 miles west of Piquetberg, *S.* 2615 : MALMESB. DIV. ; 8 miles south-east of Hopefield, *S.* 2699, *Bachmann* 1946, *Guthrie* 2056. Fl. June—July.

Schlechter's locality Piquenier's Kloof is probably false. (See footnote on p. 124).

\*Var. *β alba* Salter, var. nov. In partibus omnibus minor. *Corolla* alba, 1—1·3 cm. longa. *Pedunculi*, sicut folia, interdum pilis capitatis induti. *Foliola* angustiore obcordata. *Filamenta* dentibus valde prominentibus.

Plant much smaller in all parts. Corolla white, 1—1·3 cm. long : tube yellow. Peduncles and leaves sometimes with gland-tipped hairs : leaflets proportionately narrower. Filaments with more prominent teeth.

CLANW. DIV. ; in stagnant seasonal pools, Doornrivier, *Schltr.* 10874, *O. micradenia* M.S. (type in Bol. Herb.), 4 miles west of Clanwilliam, S. 2602 : CALVINIA DIV. ; above Botterkloof, S. 2476, 5400, 5617. Lokenberg, *Barker* 1066 Fl. May—Aug.

Though not common, owing to the scarcity of suitable habitats, it is often very abundant, carpeting the surface of the water where it does occur. Var. *β* is very distinct and has a more northern distribution. It does not occur in clay.

\*92. *O. natans* L. f. Supp. (1781) 243.—*O. rugulosa* Turcz. A water plant. *Bulb* ovoid, often 1 cm. long, with smooth blackish-brown tunics. *Stem* slender, flexuous, sometimes branching, with several amplexicaul scales. *Leaves* fairly numerous, rosulate, floating, at the apex of the stem or branches, often a few on abortive branches : petioles up to 1 cm. long, sparsely pilose, with membranous stipuliform wings at the base : leaflets 3, sessile, rather widely obcordate, slightly incised, the medial 0·6—1·2 cm. long, 0·4—1 cm. broad, the lateral rather smaller, glabrous above, sometimes very sparsely pilose about the mid-rib beneath, often more or less punctate with small orange calli. *Peduncles* 1-fl., terminal, often about 1 cm. long, glabrous, bibracteate below the middle. *Sepals* ovate or ovate-oblong, 3·5—4·5 mm. long, glabrous, with 2 or sometimes 3—4 elongate orange calli near the apex. *Corolla* white, 1—1·4 cm. long, with a broadly campanulate yellow tube : petals cuneate, scarcely attenuate below, obliquely subtruncate at the apex. *Filaments* glabrous, the shorter 1·5—2·5 mm., the longer 2·5—4 mm. long, with short broad prominent teeth. *Ovary* sometimes pubescent near the apex, the chambers 1—2-ovuled : styles glabrous or minutely pubescent. Seeds without endosperm.

CAPE PENIN. ; in stagnant pools on Flats, *Zey.* 2428, *Bolus* 4544, *MacO.* 204, *Schltr.* 1501, S. 244/10, 1712, 3566 : TULBAGH DIV. ; Piquetberg Road (now Gouda), *Tyson* 2288 : WORCES. DIV. ; S. 6848. I have not seen Bachmann's specimens from Malmesbury Div., near Darling. Fl. Sep.—Nov.

\*93. *O. uliginosa* Schltr., Eng. Bot. Jahrb. XXVII (1900) 157. A marsh plant, 6—16 cm. high, sparsely clothed with short pluricellular

viscous hairs or almost glabrous, the stem usually not exserted. *Bulb* ovoid, attenuate-acute at the apex, about 1.6 cm. long, with somewhat wrinkled acutely pointed brown scales. *Rhizome* 8—24 cm. long, with small scales. *Leaves* 10—25, imbricately clustered at the base: petioles 2—12 cm. long, sparsely viscoso-pilose, with no perceptible basal articulation, the dilated scale-like base sometimes 1 cm. long: leaflets 3, shortly petiolulate, broadly cuneate-obcordate, sometimes slightly attenuate at the base, not very deeply incised, 0.6—2 cm. long and broad, thin, glabrous or sparsely pilose beneath, ciliate, dotted with numerous reddish-brown calli, especially near the margin. *Peduncles* 1-fl., rather longer than the leaves, glabrous or viscoso-pilose, especially towards the apex, with 2 alternate subulate callose bracts on the upper half. *Sepals* 4—5 mm. long, narrowly obovate-oblong, very obtuse, with numerous conspicuous orange-brown calli on the upper 2/3. *Corolla* 1.6—2.8 cm. long, yellow, with a rather broad funnel-shaped tube: laminae of the petals widely and obliquely obovate, subtruncate, about twice as long as the attenuate claw. *Filaments*, the shorter 2.5—4.5 mm., the longer 4.5—8 mm. long, with pluricellular hairs and rather short thick projecting teeth. *Ovary* glandular-pilose on the upper half, copiously sprinkled with reddish calli, the chambers 2-ovuled: styles pluricellular-pilose. *Capsule* globose. Seeds without endosperm.

CLANW. DIV.; *Schltr.* 8015 (*type*), 5085 (erroneously cited in Plfreh-Ox. as *O. incarnata*), *Penther* 2244, *Leipoldt* 288, *S.* 3330, 5614, 6127, B.H. 14619, 20976. Fl. June—Sep.

Always growing in marshy places and on stream sides, *not* floating in water like the two foregoing species to which, although the corolla is not campanulate, it seems to be related. Lax shade plants sometimes produce a leafy stem with loosely imbricate leaves.

#### Sect. I. LATIFOLIOLATAE.

Leaflets rotund or obcordate, more rarely oval, elliptical, ovate or obovate (never linear or oblong). Plant normally stemless except in *O. campylorrhiza*, *O. amblyosepala*, *O. tenella* and *O. aridicola*. Seeds without endosperm. (Sp. 94—110).

An entirely artificial Section consisting of such species or small groups of species with broad leaflets as do not fall into the more obvious Sections. The name Latifoliolatae is admittedly somewhat meaningless and is only employed for the sake of consistency in naming the Sections. Some of the species show affinity inter se and have been placed in juxtaposition, but in such a large and complex genus it is inevitable that there must be a number of very small groups and apparently unrelated plants.



The following key may act as a check on the Analysis of the Species.

- Hairs pluricellular  
 Leaflets rotund, emarginate .. .. . *Sp.* 94—95  
 Leaflets conspicuously incised at the apex.. .. . *Sp.* 96—98  
 Hairs not pluricellular  
 Leaflets obcordate or incised at the apex.  
 Hairs glandular-pilose .. .. . *Sp.* 99  
 Hairs simple .. .. . *Sp.* 100  
 Leaflets rotund, oval or obovate, but not deeply incised at the apex.  
 Leaflets rotund, broader than long .. .. . *Sp.* 101—104  
 Leaflets oval, elliptical, ovate or obovate, longer than broad .. *Sp.* 105—110

94. *O. stenoptera* Turcz., Bull. Soc. Nat. Mosc. XXXI, 1 (1858) 433. (Journ. of S.A. Bot. VII (1941) 156.)—*O. glaucovirens* Sond. Rather robust, stemless 4—10 cm. high, more or less clothed with pluricellular hairs. *Bulb* with a contractile root, when mature ovoid-conical, acute at the apex, up to 5 cm. long, with vertically nerved splitting brown tunics, the younger elongate, narrowly lanceolate in outline, with a slender apical beak and pale brown shining wrinkled tunics. *Rhizome* 30 cm. or more long. *Leaves* often 8—15: petioles usually 2—4 cm. long, slightly flattened, pilose: leaflets 3, sessile, broadly obcordate, widely cuneate at the base, glabrescent above, sometimes sparsely pilose beneath, closely ciliate, often punctate with small brownish calli, the medial 0·6—1·5 cm. long, the lateral oblique, always rather smaller. *Peduncles* numerous, 1-fl., 2—2·5 cm. long, pilose, with 2 long alternate bracts usually partially embracing the calyx. *Sepals*, broadly lanceolate, 5—7 mm. long, densely ciliate. *Corolla* 1·5—2·5 cm. long, yellow, with a rather widely funnel-shaped tube: petals broadly cuneate, rotund or obliquely truncate at the apex, slightly attenuate into a short claw at the base, *Filaments*, the shorter 2—5 mm., the longer 4—7 mm. long, glandular-pilose, rather broadly toothed, the longest recurved at the apex. *Ovary* glandular-pilose, ecallose, the chambers 2-ovuled. Seeds without endosperm.

V. R's DORP Div.; between Eenkoker and Bitterfontein, *Zey.* 239 (*type* in Herb. Sond.), *Zey.* 242 (ex pte., in S.A. Museum); Bitterfontein district, *S.* 922B, 5349, 6638. Fl. May—June.

Sonder's description from *Zey.* 239 is misleading. The hairs are pluricellular and not gland-tipped. The glaucous colour of the upper surface of the leaflets is only observable in dried specimens and even then is not constant. I cannot understand how Sonder came to liken the leaves to those of *O. tenella* Jacq., for they do not resemble them in the least.

Var. *β alba* Salter, Journ. of S.A. Bot. VII (1941) 158. *Corolla* white, with a rather narrower yellow tube: petals with a narrow claw. Sometimes producing a leafless stem in shady situations. (Fig. 29.)

V. R's DORP Div.; Bitterfontein district *S.* 950 (*type* in Bol. Herb.), 945, 1588, 2512, 2515, 5335, 6637: NAMAQUALAND; Kamieskroon, *S.* 1538. Fl. May—July.



FIG. 29. *Oxalis stenoptera* Turcz., var. *alba* Salter. 1. Androecium  $\times 6$ . 2. A young bulb, showing (a) the shrivelled remains of the contractile root at the base and (b) the previous year's intercalary elongation of the rhizome on which the bulb was formed, natural size. 3 and 4. Petal and plant, natural size. 5. Gynaecium  $\times 6$ . 6. Leaf of var. *undulata*  $\times 2$ . 7. Sepal  $\times 6$ . 8. A mature bulb, natural size (Salter 1588).

Frequently found in seasonal stream beds and, under favourable conditions, larger in all parts than the typical form, the leaves in luxurious specimens sometimes cuneate-obovate.

\* Var.  $\gamma$  *undulata* Salter, loc. cit. 158. Stem not exserted or in shade well exserted, robust and leafless. Leaves very numerous: leaflets oblong, conduplicate-falcate towards the apex, the margins undulate, glabrous above, undotted. Corolla yellow, 2—3 cm. long, with a rather wide tube.

V. R's DORP Div.; Nieuwerust district, *S.* 5339 (type in Bol. Herb.), 2514, 4614, 5342; Karee Berge, *Schltr.* 8197 (distributed as *O. crispula* Sond.). Fl. May.

This plant bears a remarkable superficial resemblance to *O. crispula* Sond., from which it is distinguished by its bulb, pluricellular hairs, more numerous leaves, long bracts, usually embracing the ~~corolla~~, *calyx*, larger flowers, recurved longer filaments and 2-ovuled ovary chambers.

\* 95. *O. aurea* Schltr. Eng. Bot. Jahrb. XXVII (1900) 153.—*O. Maderi* Bolus f. Stemless, more or less clothed with pluricellular hairs. Bulb (mature) ovoid-conical, 4—5 cm. long, with brown splitting tunics, the younger narrow-ovoid with a longish apical beak and pale brown, wrinkled unies. Rhizome 30 cm. or more long, with a brown tunicaceous cortex. Leaves few or many, spreading: petioles terete, pilose, 1—10 cm. long: leaflets 3, shortly petiolulate, entirely glabrous, or sometimes densely ciliate and sparsely pilose beneath, often glaucous when dried, the medial cuneate-rotund, obovate or cuneate-obcordate, entire or lightly incised, 1—3.5 cm. long and broad, the lateral somewhat oblique, smaller. Peduncles 1-fld., often numerous, 1—8 cm. long, pilose, with 2 alternate linear bracts near the calyx. Sepals broadly lanceolate, more or less pilose, 6—6.5 mm. long. Corolla glabrous, 2.3—3.4 cm. long, rather pale yellow (drying golden yellow), with a wide funnel-shaped tube: petals broadly cuneate, sometimes lightly attenuate towards the base, 1.2—1.9 cm. broad. Filaments, the shorter 3—5 mm., the longer 5.5—7 mm. long, minutely glandular-pilose, with obtuse teeth. Ovary glandular-pilose and sprinkled with small orange calli on the upper half, the chambers 2—3-ovuled: styles glandular. Seeds without endosperm.

FORM A. (Typical.) Medial leaflet cuneate-rotund.

CLANW. DIV.; Modderfontein (near Citrusdal), *Schltr.* 7967 (type), near Citrusdal, *S.* 4433, 5297, 7237; near Clanwilliam, *S.* 383/25, *S.* 727, 2131, 3542, 8145, 383/25, *Leipoldt* (B.H. 19675), *Pillans* 6642. Fl. May.

FORM B. Medial leaflet oval-oblong.

Near Clanw.; *Mader* 2141, Herb. MacOwan (type in S.A. Museum, *O. Maderi* Bolus f.). (Also in Albany Mus., Grahamstown.)

The bulbs, which lie very deep, are similar to those of the foregoing species to which it is closely allied. Very large luxuriant forms are found in shady situations and there is great variation in the degree of hairiness. Some specimens from the Citrusdal area are almost glabrous, except for some scant ciliation on the sepals: those from about Clanwilliam are much more hairy and have longer pluricellular hairs. In favourable seasons it covers the hill sides in the neighbourhood of Clanwilliam, sometimes so thickly that the yellow of the flowers is visible at a great distance.

*O. Maderi* Bolus f. is apparently an etiolated form with proportionately longer leaflets.

\*96. *O. suavis* R. Knuth, Eng. Bot. Jahrb. LXI, Beibl. n. 139 (1927) 24. Small, rather lax, stemless or rarely with a short stem, up to 8 cm. high, clothed with longish pluricellular and short capitate hairs. *Bulb* ovoid, acute or shortly beaked at the apex, 2—2.5 cm. long: tunics ovate, very sharply pointed, thin, rather loose, shining, chestnut-brown. *Rhizome* 25—30 cm. long. *Stem* usually not exerted, rarely up to 3 cm. long, pilose, with a few large scales. *Leaves* 15—40, rosulate or rarely a few cauline: petioles slender, often 2—5 cm. long, broadly dilated, sub-membranous and nerved below the articulation: leaflets 3, shortly petiolate, exactly cuneate at the base, obcordately incised at the apex, 5—12 mm. long, 4.5—11 mm. broad, thin, glabrous above, sparsely pilose beneath, ciliate with gland-tipped hairs, copiously sprinkled with small, reddish-brown calli towards the anterior margin. *Peduncles* 1-fl., 2—5 cm. long, with 2 alternate filiform bracts, often 3 mm. long, near the calyx. *Sepals* lanceolate or ovate-lanceolate, often attenuate at the apex, 5—7 mm. long. *Corolla* 2—3 cm. long, slightly viscous, lemon yellow or white, with a rather broadly funnel-shaped pale yellow tube: petals subcuneate, scarcely truncate, lightly attenuate into a short conspicuously veined claw, rarely sparsely purple-maculate on the outer margin beneath. *Filaments* glandular-pilose, the shorter 2—4.2 mm., the longer 4—6.5 mm. long, with very short obtuse teeth. *Ovary* glandular-pilose on the upper half, the chambers 1—2-ovuled: styles glandular. Seeds without endosperm.

MALMESB. DIV.; Hopefield, *Bachmann* 1828 (*type*—Berlin), S. 4519 (white), 4520 (yellow). Fl. May—June.

Dr. Bachmann's plants are starved and much smaller than my specimens. The colour "violaceous" given by the author is probably a guess, but the specimens are now colourless. The yellow-flowered form seems to be the more common, but both colours grow in association. The species spreads readily from bulbs, forming dense carpets.

\*97. *O. viscidula* Schltr., Eng. Bot. Jahrb. XXVII (1900) 158. Dwarf,



about 3 cm. high, densely clothed with longish viscous pluricellular hairs, the stem short or scarcely exserted. *Bulb* unknown. *Leaves* about 12, erect or spreading: petioles 1—2 cm. long, widely dilated below the basal articulation: leaflets 3, sessile, glandular-pubescent on both faces, the medial broadly obcordate, tapering cuneately to the base, 6—7·5 mm. long, 7—8·5 mm. broad, ciliate with simple and shorter gland-tipped hairs admixed, the lateral slightly oblique. *Peduncles* 1-flid., about 1·5 cm. long, with 2 alternate (?) bracts rather above the middle. *Sepals* about 3 mm. long, ovate, pilose and ciliate. *Corolla* reddish, about 1·5 cm. long, with a yellow tube. *Ovary* oblong ovoid, glandular-puberulous: styles glandular-hispid. *Capsule* oblong, slightly exceeding the calyx.

WORCES. DIV.; hills near Worcester, 800 ft., *Schltr.* 7832. Fl. June.

This species is only known to me from dried and very imperfect specimens *without bulbs* and I retain it with the gravest doubt. *Schlechter's* plants are almost identical in appearance with *O. imbricata* E. & Z. (form *O. aganophila* Sond.) except that in the specimens in the Bolus Herb. the longer filaments are dentate and the bracts on the peduncle appear to be alternate, important differences. It is in no respect related to *O. adenodes* Sond., as suggested by Schlechter.

Owing probably to a change of tickets in Berlin Herbarium, it has been placed, in Pfirch-Ox., as a synonym of *O. goniorrhiza* E. & Z., var. *semiglaucula*.

✱ 98. *O. campylorrhiza* Salter, Journ. of S.A. Bot. II (1936) 55. Caulescent, viscous, sparsely branched, up to 15 cm. high, clothed with capitate, often pluricellular hairs. *Bulb* globose or depressed-globose, praemorse at the base, the conical apex obliquely or even horizontally deflexed, up to 2 cm. high, 3 cm. broad: tunics imbricating, subrigid, brown, splitting at the base, attenuate and sharply acute at the apex. *Rhizome* 5—10 cm. long. *Stem* erect, sometimes bifurcate, 2—12 cm. long, frequently with short branchlets. *Leaves* rather numerous, apically congested on the stem or branchlets, rarely 1—2 cauline: petioles up to 2·5 cm. long: leaflets 3, obcordate, sometimes broadly subcuneate at the base, rather thin, pinnately veined, 0·5—1 cm. long, 5—9 mm. broad, glabrous above, with pluricellular hairs beneath and on the margins, the medial shortly petiolulate, the lateral sessile. *Peduncles* 1—6, 1-flid., terminal, 2—7 cm. long, with 1—2 slender bracts above the middle, rarely ebracteate. *Sepals* ovate-lanceolate, attenuate, sharply acute, 3—6 mm. long, ciliate, rarely rubro-callose at the apex, often minutely purple-dotted. *Corolla* 1·3—2·2 cm. long, white or rarely pale rose, with short widely funnel-shaped yellow tube: petals obliquely cuneate-obovate, slightly attenuate to the base, obliquely sub-truncate,

6—10 mm. broad, purple at the extreme base, glandular-ciliate and often purple-dotted or streaked on the outer margin. *Filaments*, the shorter 2·5—4 mm., the longer 4—7 mm. long, minutely glandular-pilose below,

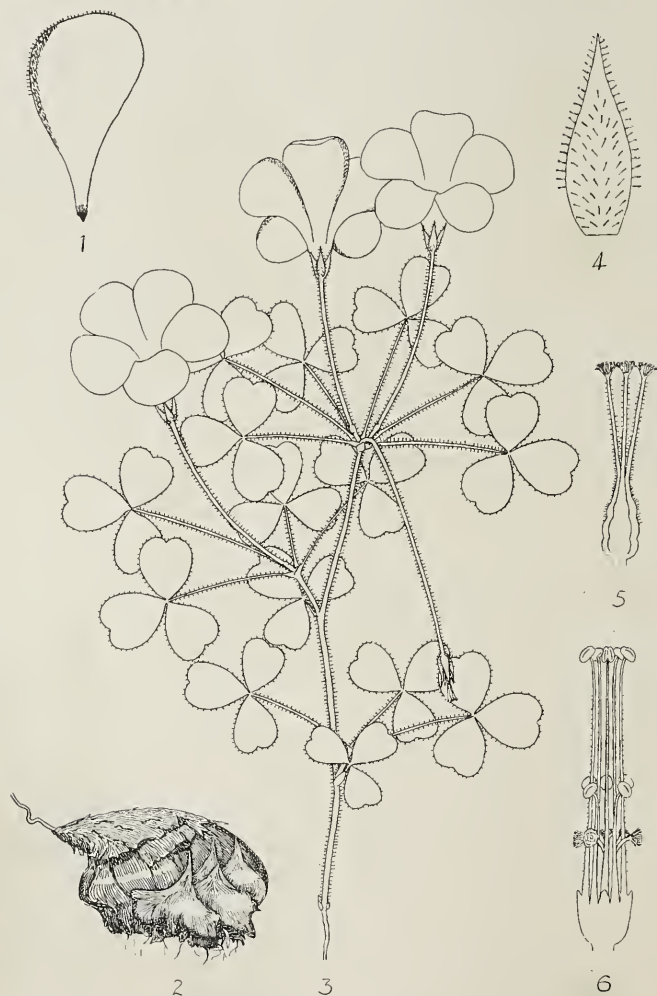


FIG. 30. *Oxalis campylorrhiza* Salter. 1. Petal  $\times 1\frac{1}{2}$ . 2. Bulb, natural size. 3. Plant, natural size. 4. Sepal  $\times 6$ . 5. Gynaecium  $\times 6$ . 6. Androecium  $\times 6$ . (Salter 5553.)

glabrous above, shortly and obtusely toothed. *Ovary* on the upper half, like the styles, glandular or pluricellular-pilose, the chambers 2—3-ovuled. *Capsule* subglobose. Seeds without endosperm. (Fig. 30).

NAMAQUALAND; 9 miles north-west of Steinkopf, *S.* 5553 (*type* in Bol. Herb.), near Steinkopf, *S.* 5557 (*pale rose*), 5558; Springbok, *S.* 897; about Kamieskroon, *S.* 800, 860, 4601, 4606. Fl. May—July.

\* 99. *O. amblyosepala* Schltr., Eng. Bot. Jahrb. XXVII (1900) 153. Lax, 5—10 cm. high, rather densely clothed with viscous gland-tipped hairs. *Bulb* unknown. *Stem* scarcely exserted or up to 5 cm. long, glandular-pilose. *Leaves* 6—24, terminally clustered, sometimes a few cauline, with petioles 1—3.5 cm. long; leaflets 3, shortly petiolulate, cuneate-obcordate or cuneate-obovate, sometimes slightly attenuate at the base, lightly incised, often conduplicate-falcate, 6—11 mm. long, 3.5—9 mm. broad, glabrous above, glandular-pilose beneath and on the margins, ecallose. *Peduncles* few, 1-fl., terminal, 2.5 cm. long; bracts 2, alternate, minute, on the upper half, rarely one wanting. *Sepals* ovate, obtuse, 3—3.5 mm. long. *Corolla* usually 1.5—2 cm. long, white, with a funnel-shaped yellow tube. *Filaments*, the longest 7 mm. long, sparsely glandular-pilose with very short teeth. *Ovary* pilose with short thick viscous hairs on the upper half. Seeds without endosperm.

CLANW. DIV.: Boontjies River, Schltr. 8671 (*type*—Berlin), Brandewyns River, Schltr. 10829, Pakhuis Pass, Leipoldt (B.H.) 18617, 21066. Fl. Aug.—Oct.

Not seen in the living state.

\* Var. *β minor* Salter. In omnibus partibus fere minor, 2—7 cm. alta. *Foliola* 4—6 mm. longa, apice raro retusa. *Sepala* angustiora, oblonga, fere 2 mm. longa. *Corolla* alba, ad 1.3 cm. longa, tubo flavo: petala, margine exteriori inferiore rubro valde lato, usque in tubum extendente.

*Note.* Owing to the impossibility of compiling a complete description of the typical form from the imperfect dried specimens, the following fuller description is given of the variety.

Small, stemless or with a shortly exserted stem, 2—7 cm. high, rather densely glandular-pilose on all parts. *Bulb* narrow-ovoid, acute at the apex, 0.6—1.2 cm. long, with brown minutely pitted tunics. *Rhizome* 1—2 cm. long. *Stem* up to 2 cm. long. *Leaves* 4—12; petioles basal or apically congested on the stem, often 1—2 cm. long; leaflets 3, shortly petiolulate, obovate or cuneate-obovate, 4—6 mm. long, 3—4 mm. broad, entire or slightly retuse at the apex, glandular-ciliate on the margins and midrib beneath, ecallose. *Peduncles* 1-fl., 1—6 cm. long, with 2 minute alternate bracts towards the apex. *Sepals* oblong, obtuse, about 2 mm. long, ecallose. *Corolla* white, up to 1.3 cm. long, with a yellow

tube : petals up to 8 mm. broad with the wide red margin beneath extending into the tube. *Filaments* (brevistylar form), the shorter 3·5 mm., the longer 5—6 mm. long, unequal, minutely glandular, edentate. *Ovary* sparsely pubescent towards the apex, ecallose, the chambers 2-ovuled : styles pubescent below.

V.R.'s DORP DIV. ; Gift Berg, *Leipoldt* (B.H. 22671). Fl. July.

- \* 100. *O. ausensis* R. Knuth, Eng. Bot. Jahrb. LIII (1915) 315, f. 3. Dwarf, stemless, entirely glabrous, 2—4 cm. high. *Bulb* structure large : tunics very numerous, loose, lanceolate or oblong, acute, brown, splitting longitudinally. *Leaves* about 12 or more numerous : petioles 1—3·5 cm. long, much widened and 3-nerved below the basal articulation : leaflets 3, the medial cuneate-obcordate, not deeply incised, rather thick (glaucous ?) 4—7 mm. long and broad, with several brownish calli towards the apical margin, the lateral oblique, usually smaller. *Peduncles* 1-fld., as long as or rather longer than the leaves, with 2 alternate or subopposite bracts above the middle. *Sepals* broadly ovate, obtuse, 2·5—4 mm. long, sometimes with several elongate reddish-brown calli on the upper half. *Corolla* yellow, 1·2—1·4 cm. (7—8 mm. long in type), with a widely funnel-shaped tube : petals cuneate, subtruncate at the apex. *Filaments*, the longer about 5 mm. long, gibbose or bluntly toothed. *Ovary* with a few reddish calli near the apex, the chambers 2—3-ovuled : styles minutely glandular-pilose. Seeds without endosperm.

S.W. AFRICA ; Aus, 4,700 ft., *Engler* 6785 (type—Berlin), *Range* 1720, *Dinter* 3566, 6256.

I have only seen *Dinter*'s specimens which are larger in all parts and evidently more luxuriant than those originally described. It appears to be an affinity of the following species.

- \* 101. *O. Sonderiana* (O. Kuntze) Salter.—*Acetosella Sonderiana* O. Kuntze.—*O. minima* Sond. (non Steud.).—*O. nidulans* Turcz. (non E. & Z.). Dwarf, stemless, glaucous, often growing in tufts, 2—4 cm. high. *Bulbs* narrow-ovoid, acute at the apex, often congested, loosely enclosed in a mass of easily separable tunics : tunics lanceolate or linear brown, shining, 2—3 cm. long, needle-pointed, splitting at the base. *Rhizome* 3—8 cm. long, minutely glandular. *Leaves* often 6—10, prostrate, with very minutely glandular-pilose petioles 1—2 cm. long, dilated below the basal articulation : leaflets 3, sessile, widely rotund, broadly cuneate at the base, often 4 mm. long, 6 mm. broad, obscurely dotted with brown calli on the upper part, glaucous above, glabrous on both faces, very minutely glandular-ciliate, the medial sometimes slightly emarginate. *Peduncles* 1-fld., 1—2 cm. long, very minutely glandular-pilose, with 2 alternate linear pale bracts a little below the calyx. *Sepals* ovate or narrow-ovate, 3—3·5 mm. long, often purple-margined, with



6—10 elongate orange-red calli on the upper part. *Corolla* 1.5—2 cm. long, yellow, with a funnel-shaped tube: laminae of the petals triangular-

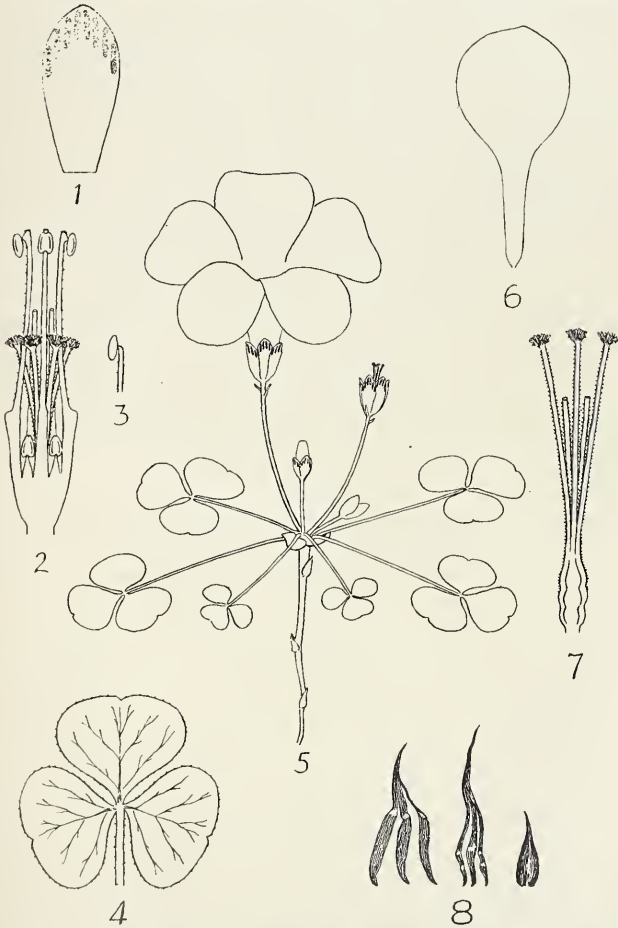


FIG. 31. *Oxalis Sonderiana* (O. Kuntze) Salter, variety *alba*, Salter. 1. Sepal  $\times 8$ . 2. Androecium  $\times 8$ . 3. Apex of long filament in *O. Sonderiana*. 4. Leaf, under side  $\times 4$ . 5. Plant  $\times 2$ . 6. Petal  $\times 2$ . 7. Gynaecium  $\times 8$ . 8. Bulb and tunics, natural size. (Salter 5309.)

obovate, about twice as long as the narrow claw. *Filaments*, the shorter 1.3—3 mm., the longer 2.5—4.5 mm. long, very minutely

glandular-pilose, with short teeth, the longest *not rostrate* at the apex. *Ovary*, like the styles, minutely glandular-pilose, the chambers 2—3-ovuled. Seeds without endosperm.

NAMAQUALAND ; Grootriet, *Zey.* 237 (*type* in Herb. Sond.), Kamieskroon, *S.* 820-1546A, Springbok, *S.* 917, 5523. Fl. May—June.

*Schltr.* 7931, from Piquenier's Kloof, attributed here in Pfeich-Ox., is *O. luteola* Jacq., var.  $\beta$ . In assuming it to be *O. minima* Sond. Dr. Knuth has erroneously described the bulb and some other characters of the wrong species.

\*Var.  $\beta$  *alba* Salter, Journ. of S.A. Bot. II (1936) 155. *Corolla* white. *Filaments*, the longest rostrate at the apex. (Fig. 31).

V. R.'s DORP DIV. ; 6—7 miles north of V. R.'s Dorp, *S.* 5309 (*type* in Bol. Herb.), 3334, 5304, Nieuwerust 5348, Bitterfontein 923, 5493 : CLANW. DIV. ; 5 miles west of Graafwater, *S.* 7244, Leipoldt B.H. 19703) : NAMAQUALAND ; Garies area, *S.* 6658. Fl. May—June.

The upper surface of the flat-lying leaves is a more vivid glaucous green than in any other South African species, though this character has disappeared in cultivation in the Cape Peninsula. The minute glandular hairs referred to in the description are difficult to detect in dried specimens.

Sonder's name *O. minima* is invalid, having been previously employed.

102. *O. inconspicua* Salter, Journ. of S.A. Bot. I (1935) 113. Small stemless, very slender, up to 6 cm. high. *Bulb* ovoid, about 1.5 cm. long : tunics acuminate at the apex, dark brown, smooth and shining, rarely pinnate-nerved. *Rhizome* 2—3 cm. long, like the fibrous roots minutely pilose. *Leaves* 6—16, prostrate : petioles 1—2 cm. long, widened below the basal articulation and often with substipulate wings : leaflets 3, broadly cuneate-obcordate or rotund-obcordate, not deeply incised, 3—7 mm. long, 4—9 mm. broad, copiously punctate with oblong brown calli on the under surface, the medial very shortly petiolulate, the lateral sessile. *Peduncles* 1-flid., 3—5 cm. long, with 2 small linear alternate bracts on the upper half. *Sepals* ovate-lanceolate, acute, 1.5—2.5 mm. long, with numerous elongate orange calli on the upper half. *Corolla* 1—1.4 cm. long white, the slightly inflated yellow tube constricted near the base : laminae of the petals obliquely obovate, narrowly purple-margined beneath, as long as the narrow-cuneate claw. *Filaments*, minutely glandular-pilose, the shorter 1.5—3 mm., the longer 2.5—5.5 mm. long, with longish acute teeth, the longest reflexed at the apex. *Ovary* glabrous or minutely glandular-pilose above, with conspicuous orange calli on the upper half, the chambers 2—3 ovuled : styles glandular-pilose. *Capsule* globose. Seeds without endosperm. (Fig. 32.)

NAMAQUALAND; Kamieskroon, S. 817 (type in Bol. Herb.), near Steinkopf, S. 2590. Fl. June—July.

The narrow-cyathiform or inflated tube of the corolla, constricted within the calyx, is a marked character of this species.

\*103. *O. petraea* Salter, Journ. of S.A. Bot. I (1935) 138. Small,

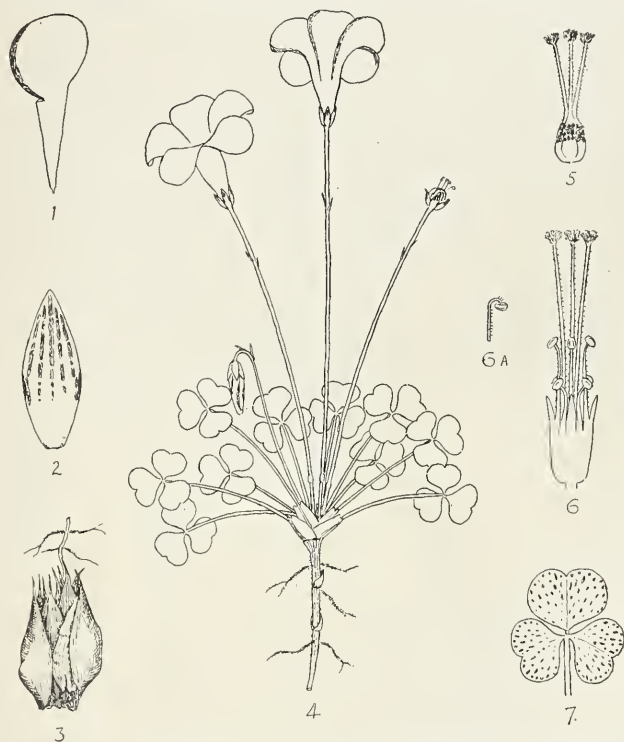


FIG. 32. *Oralis inconspicua* Salter. 1. Petal  $\times 2$ . 2. Sepal  $\times 10$ . 3. Bulb  $\times 1\frac{1}{2}$ . 4. Plant  $\times 1\frac{1}{2}$ . 5. Gynaecium  $\times 8$ . 6. Androecium showing long styles  $\times 8$ . 6A. Apex of inner filament in medio- and brevistyled forms  $\times 8$ . 7. Leaf under surface  $\times 3$ . (Salter 817.)

stemless, 3–5 cm. high, densely clothed with very short capitate hairs. *Bulbs* narrow-ovoid, up to 1 cm. long, loosely enclosed within the tunics: tunics very numerous, lanceolate, subulate or linear, often 2 cm. long, dark brown, sharply acute and often deflexed at the apex, splitting into 3 segments below, often undulate. *Rhizome* about 6 cm. long, with rather large scales. *Leaves* usually 2–6: petioles 0.5–1.5 cm. long,

widened below the basal articulation : leaflets 3, sessile, densely glandular-pilose, glandular-ciliate, glaucous above, with numerous brown calli beneath, particularly near the margin, the medial broadly obcordate, broadly cuneate at the base, not deeply incised, 4—7 mm. long, 6—10 mm. broad, the lateral rather smaller, obliquely rotund. *Peduncles*

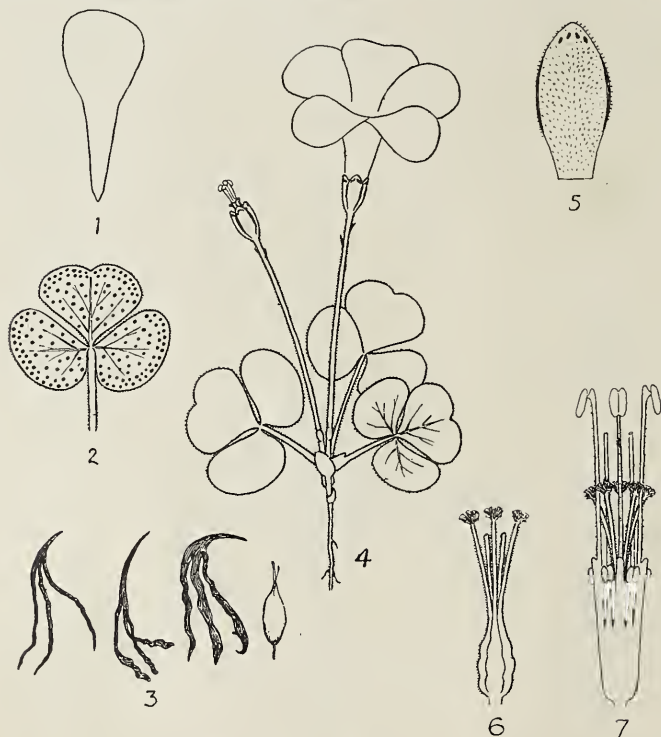


FIG. 33. *Oxalis petraea* Salter. 1. Petal  $\times 1\frac{1}{2}$ . 2. Leaf, under side  $\times 2$ . 3. Bulb and tunics, natural size. 4. Plant  $\times 1\frac{1}{2}$ . 5. Sepal  $\times 6$ . 6. Gynaecium  $\times 8$ . 7. Androecium, showing styles  $\times 8$ . (Salter 5354.)

1-fl., up to 2.5 cm. long, like the petioles conspicuously articulate at the base, with 2 small alternate bracts at the apex or a little below the calyx. *Sepals* narrow-obovate, about 4 mm. long, ciliate, sometimes purplish at the margins, often with 4 red apical calli. *Corolla* 1.6—2.1 cm. long dense y glandular-pilose, dul pink or white, with a funnel-shaped yellow tube : laminae of the petals obovate, obliquely truncate, about as long as the tapering narrow-cuneate caw. *Filaments*, the



shorter 2·5—3·5 mm., the longer 4—6 mm. long, sparsely glandular-pilose, shortly and obtusely toothed, the longest shortly rostrate at the apex. *Ovary* glandular-pilose, ecallose, the chambers 3-ovuled: styles densely and shortly glandular-pilose. (Fig. 33.)

V. R's DORP DIV.; in fissures in an outcrop of shale, 11 miles north of V. R's Dorp, *pink*, *S.* 5354 (*type* in Bol. Herb.), 6635; Knechts Vlaagte, 8 miles north of Zout River Bridge, *white*, *S.* 5487 (*cult.*). Fl. May—June.

Allied to *O. Sonderiana*.

104. *O. commutata* Sond., Fl. Cap. I (1860) 333.—*O. minima* E. & Z. (non Steud.). Small, stemless, glabrous or almost glabrous. *Bulb* narrow-ovoid, acute or attenuate at the apex, or subfusiform, 1·5—2 cm. long, with hard blackish-brown acutely pointed tunics. *Rhizome* slender, usually short. *Leaves* often 2—6, with short petioles: leaflets 3, shortly petiolulate, broadly rotund, cuneate-attenuate at the base, slightly incised at the apex, 0·3—1 cm. long, 0·5—1·4 cm. broad, minutely impresso-punctate and often greyish above when dried, green or more rarely intense purple beneath. *Peduncles* 1-fl., up to 12 cm. long, with 2 small alternate linear bracts rather above the middle. *Sepals* broadly lanceolate or oblong, acute or subobtusely, 4—5·5 mm. long, usually with 2 orange-red apical calli which are very variable in size. *Corolla* 1·2—2·6 cm. long, rose or more rarely lilac or white, with a short, very broadly funnel-shaped yellow tube: petals broadly cuneate, often obliquely truncate at the apex, 0·6—1·4 cm. broad. *Filaments*, the shorter 2·5—4 mm., the longer 5—6·5 mm. long, glandular-pilose, very shortly toothed or gibbose. *Ovary* glabrous, the chambers 5-ovuled: styles more or less glandular-pilose. Seeds without endosperm.

MALMESB. DIV.; Grootpost, *E. & Z.* 729 (ex pte. *O. minima* E. & Z.), *S.A.M.* 48365, *B.H.* 14561, *S.* 780, 2261, 2272, 3351, 6016, 6019, 6095: CAPE DIV.; *Zey.* 2114, *Schltr.* 7823, *S.* 526, 3370, 8746: CAPE PENIN.; *E. & Z.* 727 (*O. tenella*) (*type*), *W.-Dod* 889, 1495, 2482, 2509, *B.H.* 14511, 14514, 14528, *Marl.* 434, *S.* 575, 769, 2402, 3307, 8055, 8114, 8406: TULBAGH DIV.; Postelynsberg, *Drège*, *S.A.M.* 11295, *S.* 1709, 2175: WELLINGTON DIV.; *B.H.* 14515, *S.* 4502: PAARL DIV.; *Drège* 2387a, *Stokoe* 219, *S.* 6003, 6599: STELLENBOSCH DIV.; *Duthie* 495, *Schltr.* 1177, *S.* 609, 3297: CALEDON DIV.; *Schltr.* 7760, *S.* 2295, 2296, 2298, 2303, 4391: CERES DIV.; Wolverivier, *Zey.* (var. *grandiflora* Sond.), *Bolus* 7341, *S.* 2102, 2172, 2622, 6080. Fl. April—June.

Var. *β* *concolor* Salter, Journ. of S.A. Bot. VI (1940) 171. Plant smaller in all parts. *Leaflets* often deep purple beneath. *Sepals* broader, more obtuse, more or less purple on the margins, with 2 larger and conspicuous apical calli. *Corolla* reddish-purple, 1·2—1·5 cm. long,

glandular-pilose, the tube concolorous. *Stamens* purple, pollen white. *Styles* glandular-pilose, purple. (Fig. 34.)

CAPE PENIN.; Red Hill, *S.* 8407 (*type* in Bol. Herb.), 621, 4401, 6216, 6582, 8081, 8408, 8445, *Guthrie* 1143, *Pillans* 2480.

Always in damp places and on stream sides.

\* Var.  $\gamma$  **montana** Salter, loc. cit. 173. Dwarf, sometimes viscous or glandular. *Leaflets* smaller, purple beneath. *Peduncles* 0.5—2.5 cm. long. *Sepals* obtuse, the apical calli inconspicuous or wanting. *Corolla* more or less rosy or pale mauve, with a yellow tube.

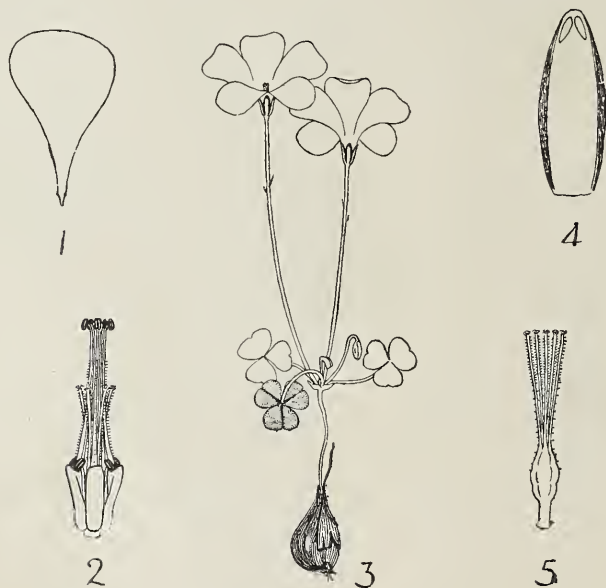


FIG. 34. *Oxalis commutata* Sond., var. *concolor* Salter. 1. Petal  $\times 2$ . 2. Androeium  $\times 6$ . 3. Plant, natural size. 4. Sepal  $\times 8$ . 5. Gynaecium  $\times 6$ . (Salter 8407.)

CERES DIV.; Gydouw Pass, *Leipoldt* (B.H. 19757, *type*), *S.* 2288, 2633, Cold Bokkeveld Mts., *Stokoe* (B.H. 22436); CLANW. DIV.; *B.H.* 14582, 21867, *Levyms* (*S.* 6404), *Edwards* 230; WORCES. DIV.; *B.H.* 21868. Fl. June—Sep.

A mountain variety.

Var. *grandiflora* Sond. is purely an epharmonic form and cannot be upheld.

Var. *pusilla* R. Knuth (Schltr. 10436, Papiessvlei), named *O. Dammeriana* by Schlechter, is *O. depressa* E. & Z. Schltr. 8911, Cold Bokkeveld, is not this species but akin to *O. nidulans* E. & Z.

*O. commutata* has often been confused with *O. convexula* Jacq. and *O. depressa* E. & Z. It differs from both in the complete absence of the stipule-like wings below the articulation at the base of the petiole.

105. *O. tenella* Jacq. Oxal. (1794) 53, t. 19.—*O. divergens* E. & Z.—*O. decora* R. Knuth.—*O. brevisepala* Weintroub. (*O. tenella* Lodd. Bot. Cab. t. 1096). Slender, 2—20 cm. high, the stem usually well exserted. *Bulb* ovoid, often 1 cm. long, with soft brown papery tunics. *Rhizome* slender, 3—6 cm. long, often enclosed in a thin tunicaceous cortex. *Stem* erect, usually 1—10 cm. long, minutely pubescent, with 1—3 amplexicaul scales or small abortive leaves, rarely not exserted. *Leaves* few or many, terminally congested: petioles 1—3 cm. long, pubescent, with a few glandular hairs admixed: leaflets 3, obovate, cuneate-obovate or cuneate, slightly incised at the apex, sometimes conduplicate, up to 1.2 cm. long, glabrous above, pubescent beneath, minutely ciliate, the medial very shortly petiolulate. *Peduncles* rather numerous, as long or twice as long as the leaves, with others very short, undeveloped and producing almost sessile buds only, pubescent, with glandular hairs admixed, particularly near the apex: bracts 2, linear, alternate, on the upper part of the peduncle. *Sepals* lanceolate or ovate-lanceolate, 2—4 mm. long, pubescent, ciliate, pale reddish, sometimes purple-streaked on the margins, ecallose. *Corolla* 1.1—2.4 cm. long, glabrous, fugitive, white, pale rosy-violet or rarely a rich yellow, with a funnel-shaped yellow tube: laminae of the petals narrow-obovate, 3.5—7 mm. broad, rotund at the apex, about as long as the narrow-cuneate claw. *Filaments*, the shorter 2.5—4 mm., the longer 4—6 mm. long, often with short pluricellular hairs on the upper part, edentate. *Ovary* oblong, pubescent and callose on the upper half, the chambers 4-ovuled: styles pubescent below, with longer pluricellular hairs above. *Capsule* oblong, about 8 mm. long, well exserted beyond the calyx. Seeds without endosperm.

FORM A. *Corolla white*.

PIQBG., CLANW., and V. R's DORP DIVS.; Drège (near Berg River), E. & Z. 722 (*O. divergens* E. & Z.), Schltr. 7898, 7995, 10826 (*O. decora* R. Knuth), Edwards (B.H. 14945, *O. brevisepala* Weintroub), Leipoldt 290, 435, 702, 705, B.H. 20418, Mader 2159, Andree 468, Pillans 6652, 6671, S. 383 (16, 18, 672, 690, 751, 2137, 2499, 3321, 3323, 5287, 5300; 5357, 5389, 6109, 6625, 6628, 6630, 8139, 8144. Fl. May—July.

FORM B. *Corolla yellow*.

PIQBG. Div.; 4 miles north of Piquetberg, S. 2441, 6626. S. 6627 (corolla cream-coloured), a colour hybrid.

The typical form is abundant in Clanwilliam Div. and common in the northern part of Piquetberg Div. It is very variable in its size and

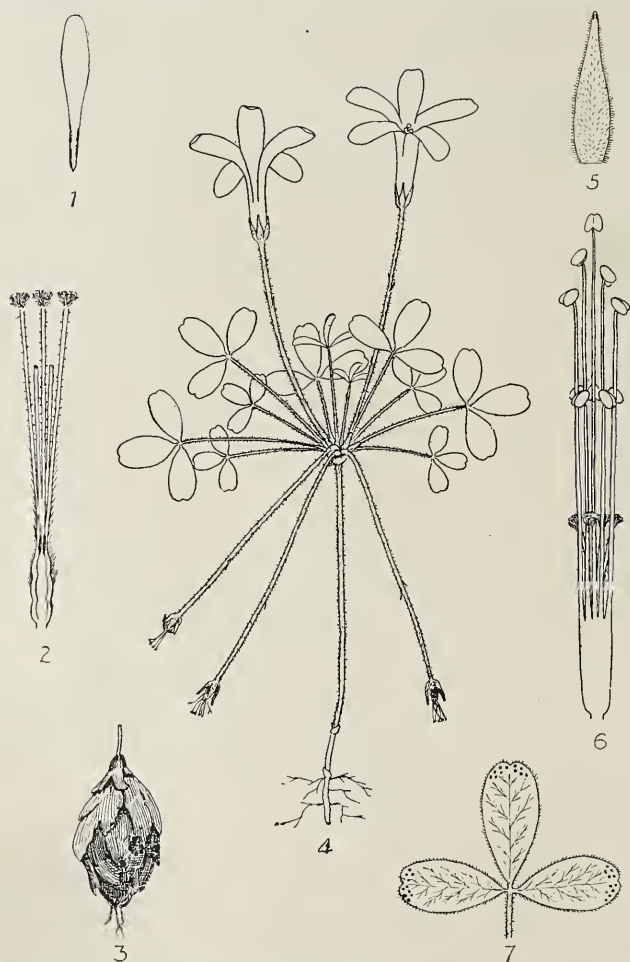


FIG. 35. *Oxalis aridicola* Salter. 1. Petal, natural size. 2. Gynaecium  $\times 6$ . 3. Bulb, natural size. 4. Plant, natural size. 5. Sepal  $\times 6$ . 6. Androecium  $\times 6$ . 7. Leaf, under side  $\times 2$ . (Salter 2467.)

in the shape of the leaflets and much affected by epharmonic conditions. Specimens grown from bulbs taken from a large colony of minute plants



found in clayey gravel near Pools Siding in Piquetberg Div. (*S.* 751, 3321) attained to normal size in cultivation.

Form B, with yellow flowers is very local. A number of plants with flowers of varying shades of cream (*S.* 6627), growing in association with the yellow (*S.* 6626) and white (*S.* 6628) forms, are apparently of hybrid origin.

✱106. *O. aridicola* Salter, Journ. of S.A. Bot. I (1935) 121. Slender, caulescent, up to 13 cm. high, pubescent, with longer glandular hairs admixed. *Bulb* ovoid, acute at the apex, about 2 cm. long, with rigid blackish-brown tunics. *Rhizome* often 6—8 cm. long. *Stem* 4—7 cm. long, rarely branching, with 1—3 small scales. *Leaves* up to 18, apically congested, rarely 1—2 cauline: petioles slender 0.5—2 cm. long: leaflets 3, shortly petiolulate, narrowly cuneate-obovate, slightly incised at the apex, sometimes conduplicate-falcate, usually about 8 mm. long and 4 mm. broad, glabrous above or pubescent on both faces, ciliate, often punctate with small, brown, inconspicuous calli toward the apex. *Peduncles* 1-fl., 1—3.5 cm. long, twice as thick as the petioles, with 2 alternate filiform reddish-brown bracts on the upper half. *Sepals* lanceolate or broadly lanceolate, attenuate, 3—4 mm. long, ciliate, with 2 elongate reddish apical calli. *Corolla* 1.5—2.5 cm. long, pale violaceous, with a rather long, very narrowly funnel-shaped or subcylindrical glandular-pilose yellow tube: petals oblanceolate, attenuate to the base, 3—4 mm. broad, glandular pilose on the outer margin beneath. *Filaments*, the shorter 6—9 mm., the longer 8.5—13 mm. long, unequal, glabrous or minutely glandular-pilose, edentate. *Ovary* oblong, pubescent on the upper half, with elongate calli at the apex, the chambers 2—3-ovuled: styles pubescent below, glandular-pilose above. Seeds without endosperm. (Fig. 35.)

CLANW. DIV.; about Langekraal, *S.* 2467 (*type* in Bol. Herb.), 4440, 4547, B.H. 19692: CALVINIA DIV.; near Doornbosch, *S.* 5379. Fl. May—July.

Occurs in a particularly arid district and in most seasons is only found in a dwarf and starved condition. The *type* was collected in an unusually favourable season and closely resembles cultivated specimens.

?? 107. *O. Stokoei* Weintraub, Journ. of Bot. LXIX (1931) 208.—*O. Stokoei* Weintraub, var. *longifolia*. Dwarf, 2—3 cm. high. *Bulb* ovoid or globular-ovoid, acute at the apex, up to 1.5 cm. long; tunics thin, brown, the outer usually splitting into slender subfibrous matted segments, the inner often undulate. *Rhizome* slender, short. *Stem* usually not exerted, rarely 5 mm. long, sparsely pubescent. *Leaves* 2—5, with reddish-brown pubescent petioles 1—2 cm. long: leaflets 3, petiolulate, subrotund cuneate-obovate, cuneate or linear, conduplicate-falcate, minutely

emargina e, 0.3—1 cm. long, glabrous above, pubescent beneath, rather indistinctly punctate with numerous small, brown calli. *Peduncles* 1-fl., about as long as the leaves, glabrous or pubescent, reddish-brown, with 2 alternate bracts on the upper part. *Sepals* ovate-lanceolate to linear-lanceolate, 2.5—6 mm. long, pubescent, ciliate, reddish-brown, often with orange-red callose margins. *Corolla* 1.3—2.3 cm. long, sometimes sparsely pubescent, rosy-purple, with a short funnel-shaped yellow tube and often with a dark purple eye in the throat: laminae of the petals rather narrowly ovate, 2—3 times as long as the slender claw. *Filaments* very variable in length, the longer minutely glandular-pilose, edentate, the longest somewhat exerted from the corolla tube: anthers very small, broader than long. *Ovary* glabrous or pilose on the upper half, callose at the apex, the chambers 1—2-ovuled: styles with both simple and glandular hairs. *Capsule* depresso-globose. Seeds without endosperm.

WORCES. DIV.; Brandwacht Mt., *Stokoe* (B.H. 19226, type in Bol. Herb.) Paardeberg ?, *Leipoldt* (S.A.M. 48374, *O. Stokoei* var. *longifolia* Weintroub): CERES DIV.: *Stokoe* (B.H. 20446), *Leipoldt* (B.H. 19718, 19720, 19752), S. 2212 2281, 6079, 8118: CLANW. DIV.; Driehoek, S. 5084 (doubtful). Fl. Apr.—June.

An affinity of the following species, but distinguishable by its bulb and the nature of the calli on the leaflets. The leaflets are very variable in shape and in the length of the petiolules which perhaps lengthen after flowering. The characters on which var. *longifolia* (the commoner form) has been founded are not sufficiently well defined to justify its separation as a variety. Usually growing in damp places in mountains.

✱ 108. *O. petiolulata* Bolus f., Ann. Bol. Herb. II (1918) 27. Dwarf, stemless, 3—5 cm. high. *Bulb* very narrowly ovoid or oblong, attenuate, acute at the apex, up to 1.3 cm. long, with firm, dark brown, minutely areolate tunics. *Rhizome* slender, rather short. *Leaves* glabrous, few or many: petioles dark reddish-brown, often 1—1.5 cm. long: leaflets 3, petiolulate broadly ovate often conduplicate-falcate, entire, 3—6 mm. long, with a line of rather large dark calli along the margin. *Peduncles* 1-fl., glabrous, often 1—2 cm. long, with 1—2 minute bracts on the upper part of bracteate. *Sepals* more or less oblong-lanceolate, 2.5—5 mm. long, minutely ciliate, with 2 or more apical calli. *Corolla* 1.7—2.2 cm. long, deep pink, with a purple eye in the throat: tube dull yellow. *Filaments*, the shorter 3—4.5 mm., the longer 5—7 mm. long, minutely glandular-pilose, gibbous. *Ovary* pubescent or glandular on the upper half, ecallose, the chambers 3—4-ovuled: styles pubescent below, glandular-pilose above.

CLANW. DIV.; Wupperthal, *Bolus* 8952, fl. Aug. (type in Bol. Herb.),

Krakadouw, Adamson (B.H. 20492), fl. May.

In no respect related to *O. aemula* R. Knuth (*O. decipiens* Schltr.) as suggested by Mr. Bolus. This mountain species is not known to me in the living state, but it seems to be separable from the foregoing. The *type* specimens are without bulbs, but those of B.H. 20492, described above, are totally different from the bulb of *O. Stokoei*.

109. *O. callosa* R. Knuth, Eng. Bot. Jahrb. LXI, Beibl. n. 139 (1927) 16.—*O. oculata* Salter, Journ. of S.A. Bot. I (1935) 136. Small, stemless, or with a short stem, 2—9 cm. high, not tufted in habit. *Bulb* ovoid or narrow-ovoid, acute at the apex, 1.5—2.5 cm. long: tunics thin, imbricate, brown, minutely impresso-punctate. *Rhizome* up to 10 cm. long, with several lateral underground scale-bearing runners or stolons, producing bulbils at their apices. *Stem* none, or up to 1.5 cm. long, densely clothed with short crispate hairs. *Leaves* 7—20, basal or apically congested: petioles up to 2 cm. long, patently cano-pubescent, the outer often scale-like or dilated below the basal articulation: leaflets 3, shortly petiolulate, oval, elliptical or cuneate-elliptical, conduplicate-falcate, emarginate, 6—8 mm. long, 4—6 mm. broad when flattened, glabrous above, adpressed-pubescent beneath, ciliate. *Peduncles* 1-fl., 1—3 cm. long, a little longer than the leaves, cano-pubescent, with 2 alternate subulate pubescent callose bracts on the upper part. *Sepals* lanceolate, obtuse, 4—5 mm. long, pubescent, ciliate, with oblong orange calli at the apex and margins, sometimes purple-margined on the lower part. *Corolla* 1.7—2.1 cm. long, rose-red, with a funnel-shaped yellow tube, purple-eyed at the throat: laminae of the petals obovate, 9—10 mm. broad, truncate at the apex, pubescent on the outer margin beneath, with several small orange calli near the apex, rather longer than the narrow claw. *Filaments*, the shorter 3.5—7 mm. long, the longer 7—10 mm. long, minutely glandular-pilose, edentate, the longest well exerted from the corolla tube. *Ovary* pubescent on the upper part, with elongate red calli between the 1—2-ovuled chambers: styles pubescent at the base, shortly pluricellular-pilose above, the longest exerted. Seeds without endosperm. (Fig. 36).

CALVINIA DIV.; Hantam Gebirge, Meyer (*type*—Berlin), about Nieuwoudtville, *S.* 5363 (*O. oculata* Salter), *S.* 1649A, 2482 (cult.), 4559, 4471, 4472, Oorlog's Kloof River, 4447, 5373. Fl. May—June.

\* Var.  $\beta$  *minor* Salter, Journ. of S.A. Bot. I (1935) 136. Plants tufted. *Corolla* much smaller, deeper red. *Rhizome* without underground runners.

CALVINIA DIV.; Oorlog's Kloof River, *S.* 5372 (*type*), 2482.

Var.  $\beta$  was growing in association with *S.* 5373 (typical) and the differences in habit were very noticeable, the plants growing in tufts, in-

dicating that the bulbils are sessile on the rhizome. The dark purple eye in the throat of the corolla seems to be a constant character in this species.

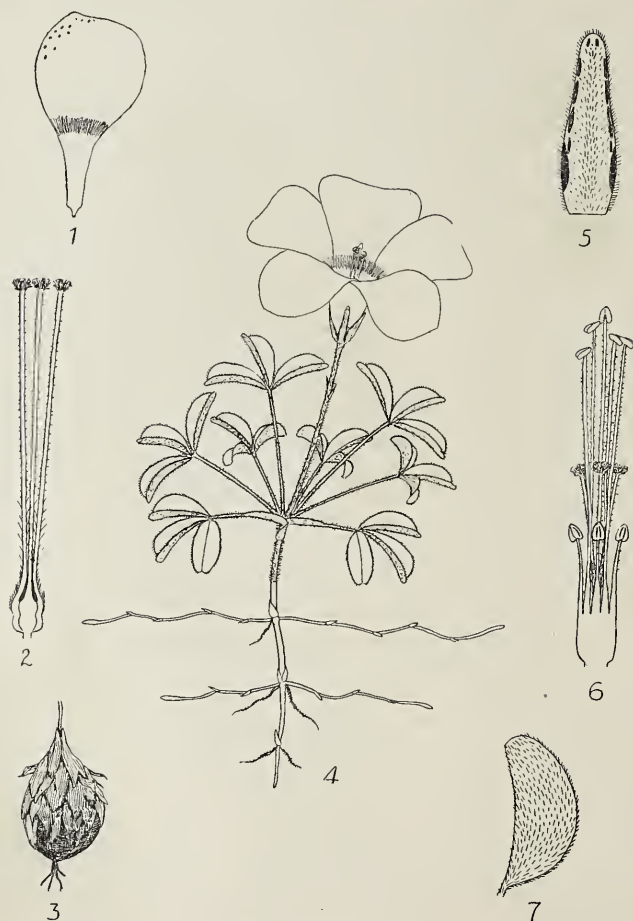


FIG. 36. *Oxalis callosa* R. Knuth. 1. Petal  $\times 1\frac{1}{2}$ . 2. Gynaecium  $\times 5$ . 3. Bulb, natural size. 4. Plant  $\times 1\frac{1}{2}$ . 5. Sepal  $\times 6$ . 6. Androecium  $\times 5$ . 7. Under side of leaflet folded  $\times 3$ . (Salter 5363.)

Meyer's *type* at Berlin, which I had unfortunately not inspected when I described and figured *O. oculata*, is very poor and starved, but



undoubtedly the same. The species is quite unrecognisable from the original description in Eng. Bot. Jahrb. and is completely redescribed here from normal plants. Since the author makes no mention of calli on the plant and describes the leaflets and sepals as "non callosa", I am unable to understand the application of the trivial name.

✱ 110. *O. hirsuta* Sond., Fl. Cap. I (1860) 327.—*O. Dejagerae* L. Bolus. Dwarf, stemless, canescent, glaucous, up to 5 cm. high. *Bulbs* congested, narrow-ovoid, up to 2 cm. long, attenuate into a curved beak at the apex: tunics very numerous, thin, dark brown, shining, in a loose elongate mass up to 15 cm. long, some more or less lanceolate, acutely pointed, the majority narrow-linear, undulate, contorted and interwoven. *Rhizome* 10—15 cm. long, with rather large scales. *Leaves* often numerous, 30—100 or more, closely rosulate: petioles densely pilose, often 2—4 cm. long: leaflets 3, subsessile, conduplicate-falcate, the margins conspicuously undulate, pilose, sparsely above, densely beneath, the medial ovate, 0·5—1 cm. long, 3·5—8 mm. broad, truncate, lightly incised at the apex, very shortly cuneate at the base, the lateral more orbicular. *Peduncles* 1-flid., 1—3 cm. long, pilose, with 2 alternate linear bracts. *Sepals* more or less lanceolate, densely pilose, 4—5·5 mm. long. *Corolla* 2 cm. long, pale rose, with a pale yellow funnel-shaped tube: laminae of the petals subcuneate, obliquely truncate at the apex, up to 7 mm. broad, rather longer than the attenuate claw. *Filaments*, the shorter 3 mm., the longer 4·5—7·5 mm. long, glandular-pilose, edentate. *Ovary* canovillous on the upper half, the chambers 1-ovuled: styles with a few simple hairs near the base, glandular-pilose above. Seeds without endosperm.

BEAUFORT WEST DIV. ; on the road from Rhinosterkop to Beaufort, *Zey.* (type in Herb. Sond.), *I de Jager* (B.H. 18909, *O. Dejagerae* L. Bolus), B.H. 21533: CALVINIA DIV. ; S. 4458. Fl. Apl.—May.

The type in Sonder's Herbarium is a small, very much starved specimen. Although the leaflets are undulate on the margin, this species is in no way related to *O. crispula* as suggested by Sonder.

#### Sect. J. CRASSULAE.

Stemless plants, somewhat succulent for the genus and readily falling apart at the articulations in the dried state. Scales enclosing the bases of the petioles large, ovate. Petioles conspicuously articulated to the much widened or winged base, usually pulvinate at the apex. Leaflets 1-many. Bulbs mostly attaining their depth by specialised roots upon which the new bulb is formed laterally. Seeds without endosperm. (Sp. 111—118).

This Section includes species hitherto placed in the Sections Pteropodae and Multifoliolatae, together with the allied *O. namaquana* Sond. (§ Tripartitae) and several very distinct species of later discovery.

The § Pteropodae has been characterised by the presence of foliaceous wings on the petioles, but judged by this character alone, it is difficult to find a definite line for its separation, for in some forms the wings are exceedingly narrow and scarcely perceptible, while in others the foliaceous petiole-wing is replaced by a narrow but conspicuous cartilaginous margin.

In *O. asinina* Jacq., with narrow petiole-wings, the first juvenile leaf produced by the bulbil (and also that of the seedling) is simple, the next bifoliolate and in the mature plant, in some forms 3-foliolate and in others 4—5-foliolate. The early leaf development in *O. fabaefolia* Jacq., which has wider, sometimes semicircular wings, has not been observed, but Jacquin in his description of the synonymous *O. crispa* Jacq. (Oxal. p. 38) states that the leaflets are 3, 2 or rarely 1, just as he does in *O. asinina* and it is probably safe to assume, since the two are so obviously closely related forms, that the early leaf development is the same in both.

The fleshy species in § Multifoliolatae R. Knuth—*O. flava* L., *O. pectinata* Jacq., *O. flabellifolia* Jacq. and *O. lupinifolia* Jacq.—which have been distinguished in existing keys by their yellow flowers (although in all of them, just as in § Pteropodae, pale mauve flowers are equally common), appear, when sufficient material is examined, to merge one into the other. There appear to be no distinctive floral characters in this group and such characters as the shape and number of the leaflets, their narrow cartilaginous or undulate margins and enlargement of 1—2 sepals are probably not of specific value and these plants are therefore grouped under *O. flava* L. As far as is known none of them except some forms nearest to *O. lupinifolia* produces simple juvenile leaves, while in others, superficially very similar, all the leaves are of the adult type. The form with simple juvenile leaves never seems to produce mature leaves with more than 5 leaflets.

Although it is perhaps impossible to say with certainty, I am strongly of opinion that Jacquin's figure (t. 72) of *O. lupinifolia*, with 7—8 leaflets, is not a form with simple juvenile leaves and I believe it to be only one of the broad-leaflet forms of the *O. flava* group. Since intermediate forms occur, I cannot uphold it as a named variety.

The plants which are known to produce simple juvenile leaves are probably more closely related to the § Pteropodae or form an intermediate link, but as far as our knowledge goes at present, they can only be separated when there is real evidence, either in cultivation or on the rare occasions when juvenile leaves are found in the field. Since most of

the herbarium specimens now placed under *O. lupinifolia* are without juvenile leaves, it is not possible to separate them on these lines. It must be borne in mind that the determination of herbarium specimens which, as in this case, do not show all the essential characters, however desirable it may be to achieve it, is not the most important factor in deciding how plants are to be classified, but as an interim measure, those which are known to produce simple juvenile leaves are cited separately under Form G of the comprehensive group-species *O. flava*. *O. fabaefolia* is, with some hesitation, retained as a separate species with a Form B to include specimens with the narrower petiole-wings.

The early leaf development is evidently a character of far greater specific importance than those on which the species have hitherto been separated. The whole group provides one of the most marked instances of the typical polymorphism of the genus and, if any really definite divisions can be made, it can only be done after long research. It is by no means certain that all the forms produce bulbils on the rhizome, in which case the problem may only be soluble from the seedlings, an undertaking which will present the greatest difficulties.

For notes on the bulbs in this Section see Introduction Part XII, sect. (i) The Bulb and System of Vegetative Reproduction

## Key.

Petiole winged	..	..	..	..	..	..	..	..	<i>Sp.</i> 111
Petiole not winged	..	..	..	..	..	..	..	..	..
Leaves compound									
Leaflets usually more than 3	..	..	..	..	..	..	..	..	<i>Sp.</i> 112—115
Leaflets always 3	..	..	..	..	..	..	..	..	<i>Sp.</i> 116—117
Leaves simple	..	..	..	..	..	..	..	..	<i>Sp.</i> 118

111. *O. fabaefolia* Jacq. Oxal. (1794) 41, t. 27.—*O. crispa* Jacq.—*O. fabaefolia* Jacq., var. *crispa* Jacq.) Sond. (Further synonymy given under *Form B*). Stemless, rather succulent, entirely glabrous. Bulb ovoid or ovoid-conical, acute or rostrate at the apex, up to about 4 cm. long, sometimes even larger: outer tunics brown, splitting, forming in old bulbs a somewhat matted fibrous coating. Rhizome long, enclosed in a brown tunicaceous cortex, with broad membranous scales, the upper large, brown and prominent. Leaves often 5—10: petioles 1.5—2.5 cm. long, dilated below the basal articulation, with foliaceous wings, the pair suborbicular, elliptical, obovate or ligulate in outline, usually somewhat attenuate towards the base, the medial petiole prominent: leaflets 2—5, suborbicular, elliptic, obovate or oblanceolate, usually 1.5—4 cm. long, rather thick, sometimes undulate along the narrowly cartilaginous margin, the earliest juvenile leaves simple. Peduncles 1-flid., 1—7 cm. long, with 2 linear callus-tipped bracts near the calyx. Sepals oblong

or elliptic-oblong, obtuse, 5—10 mm. long, unequal in width, rarely 1—2 larger, subspathulate, usually with 2 or more brown apical calli. *Corolla* 2—3 cm. long, yellow, pale mauve or white, with a widish funnel-shaped yellow tube, rarely with a purple eye at the throat: laminae of the petals obovate, 0·8—1·5 cm. broad, a little longer than the claw. *Filaments*, the shorter 3·5—5 mm., the longer 4·5—7·5 mm. long, very minutely glandular-pilose, with short broad obtuse teeth. *Ovary* glabrous, ecallose, the chambers 2—3-ovuled: styles glandular-pilose on the upper half. Seeds without endosperm.

FORM A. Typical. Pair of petiole-wings suborbicular, elliptical or obovate in outline. Leaflets 1—3.

V. R's DORP Div.; between Klaver and V. R's Dorp, *Schltr.* 8081, *Pillans* 6675, *B.H.* 21960, *S.* 375/16, 694, 718, 3337, 5310, 5311, 5313, 5330, 7348. Fl. May.

Colonies occur with flowers of different colours growing in association. The leaves vary a great deal in size under the influence of climatic conditions. The undulation at the margin of the leaflets in *O. crispa* Jacq. is not even of varietal value, similar undulation being found in varying degrees in several species, particularly in arid situations. One specimen in the set *S.* 3337 has one of the sepals much larger than the rest and broadly spathulate in shape, exactly as in the species *O. flabellifolia* Jacq. A similar abnormality has been observed in some colonies of *O. purpurea* L.

FORM B. Wings of the petiole narrow. Leaflets oblanceolate or cuneate-obcordate.

(i) Corolla yellow. Leaflets 1—3.—*O. asinina* Jacq.—*O. lanceaefolia* Jacq.

V. R's DORP Div.; *S.* 712, 5320, Knecht's Vlaagte, *S.* 5456 (cult.). Fl. May.

(ii) Corolla pale mauve or white. Leaflets 1—5.—*O. leporina* Jacq.

V. R's DORP Div.; *S.* 736B, 2488, 5323, 5324.

The petiole-wings in all the above specimens, except *S.* 5456, are narrower than those illustrated by Jacquin.

The so-called varieties *Consolii* Tod., *Majoranae* Tod. and *Coppelerii* Tod., all cultivated, are not worthy of distinction.

(See introduction to § *Crassulae*).

112. *O. cathara* Salter, Journ. of S.A. Bot. I (1935) 75. Rather robust, stemless or with a short stem, glabrous except on the peduncles. *Bulb* ovoid, up to 2·5 cm. long: tunics with long filiform tips, the longest surrounding the rhizome. *Rhizome* up to 25 cm. or more long. *Leaves* 7—11: petioles 3—10 cm. long, slightly pulvinate at the apex, the basal part, below the articulation, much widened, 3-nerved, with



tipule-like membranous wings: leaflets 8—12, linear or narrowly linear-cuneate, thin, 2—5 cm. long, 2—3 mm. broad, emarginate, some-

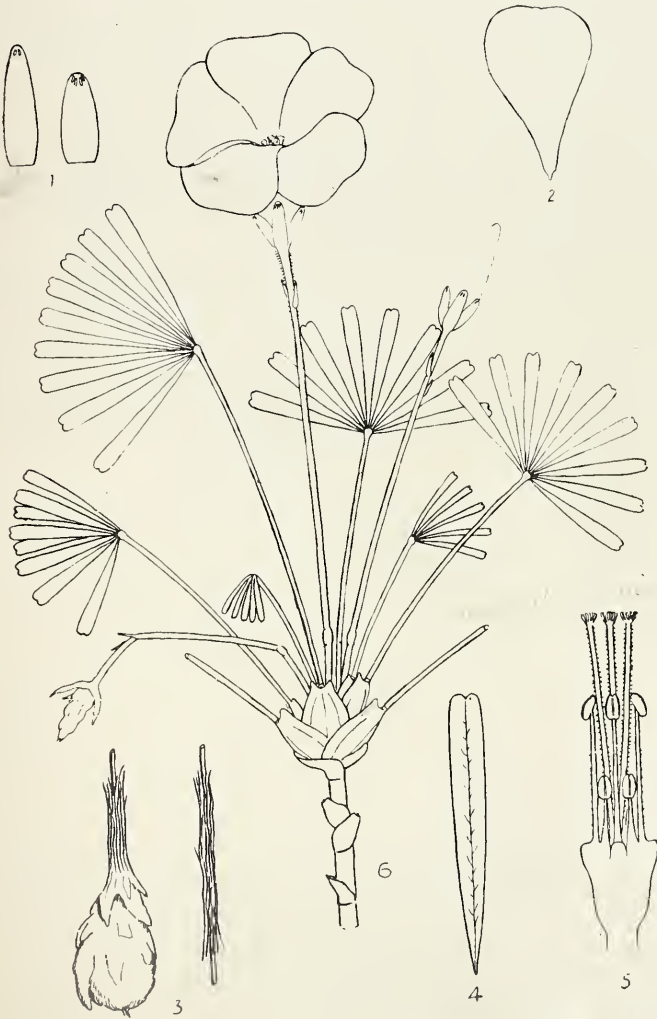


FIG. 37. *Oxalis cathara* Salter. 1. Sepals  $\times 2$ . 2. Petal, natural size. 3. Bulb and part of rhizome, natural size. 4. Leaflet  $\times 2$ . 5. Androecium and styles  $\times 8$ . 6. Plant, natural size. (Salter 2526.)

times conduplicate, the medial nerve conspicuous, with 2 minute orange apical calli. *Peduncles* 1-fl., up to 18 cm. long, glabrous below, glandular-pilose towards the apex, with 2 alternate lanceolate bracts on the upper part. *Sepals* oblong-lanceolate, obtuse, 7—9 mm. long, with 2—5 elongate orange apical calli. *Corolla* 2·2—2·8 cm. long, white, or lemon-yellow, with a funnel-shaped pale yellow tube: petals cuneate-obovate, slightly attenuate at the base, sometimes retuse at the apex, 1·2—1·7 cm. broad. *Filaments*, the shorter 3—4 mm., the longer 4·5—7 mm. long, minutely glandular-pilose below, glabrous above, prominently gibbose. *Ovary* minutely glandular-pilose on the upper half, the chambers usually 4-ovuled: styles minutely glandular. *Capsule* conical, shortly exserted. Seeds without endosperm. (Fig. 37.)

V. R's DORP DIV.; *white*, 7 miles north of Bitterfontein, *S.* 5496: NAMAQUALAND; 9—10 miles south of Garies, *S.* 2526 (*type* in Bol. Herb.), 5500, 5598; *yellow*, 5597, 3 miles north of Garies, *S.* 6669. Fl. June—July.

Rather local and only appearing in favourable seasons. The two colour forms were only once found in association (*S.* 5597 and 5598), the white predominating. The whole plant breaks up very readily at the articulations in drying.

✱ 113. *O. pulvinata* Salter, Journ. of S.A. Bot. VI (1940) 170, Dwarf, stemless, entirely glabrous, 2—4 cm. high. *Bulb* oblong, acute at the apex, up to 3 cm. long: tunics papery, pale brown. *Rhizome* long, enclosed in a brown papery cortex. *Leaves* 2—4, smoky-green: petioles filiform, rigid, 2—5 cm. long, abruptly swollen and pulvinate both at the apex and at the base above the basal articulation: leaflets 7—13, linear, 0·8—5 cm. long, about 2 mm. broad, ecallose, conspicuously channelled (in section U-shaped), slightly falcate towards the apex, the margins converging at the apex as in the prow of a boat. *Peduncles* 1·5—2 cm. long, with 2 alternate subulate bracts, about 2 mm. long, near the apex. *Sepals* oblong-lanceolate, obtuse, ecallose, 7 mm. long, with minute purple striae. *Corolla* about 2 cm. long, pale rose, with a rather broadly funnel-shaped yellowish tube: petals cuneate, rounded at the apex, slightly attenuate towards the base, with 2 blood-red papillate swellings, 3 mm. long, on the margins at the base. *Filaments* glabrous, the longer 6 mm. long, shortly and obtusely toothed, blood-red below from the base to the teeth, pale in the free part. *Ovary* oblong, the chambers 3-ovuled, like the styles glabrous. (Fig. 38.)

CALVINIA DIV.; 13 miles south of Loeriesfontein, *S.* 7340 (*type* in Bol. Herb.). Fl. in cult. April—May.

It is probable that forms with yellow flowers occur as in *O. flava* L. and its affinities.

114. *O. flava* L. Sp. Pl. I (1753) 433. (Jacq. t. 73 and t. 74, f. 2). (*A group-species*).—*O. pectinata* Jacq.—*O. flava* L., vars. *Thunbergiana* Sond. and *pectinata* Sond. (*Further synonymy given under the different Forms*). Rather robust, 3—25 cm. high, usually entirely glabrous, the stem not or rarely exserted. *Bulb* oval or ovoid, 1·5—4 cm. long : outer

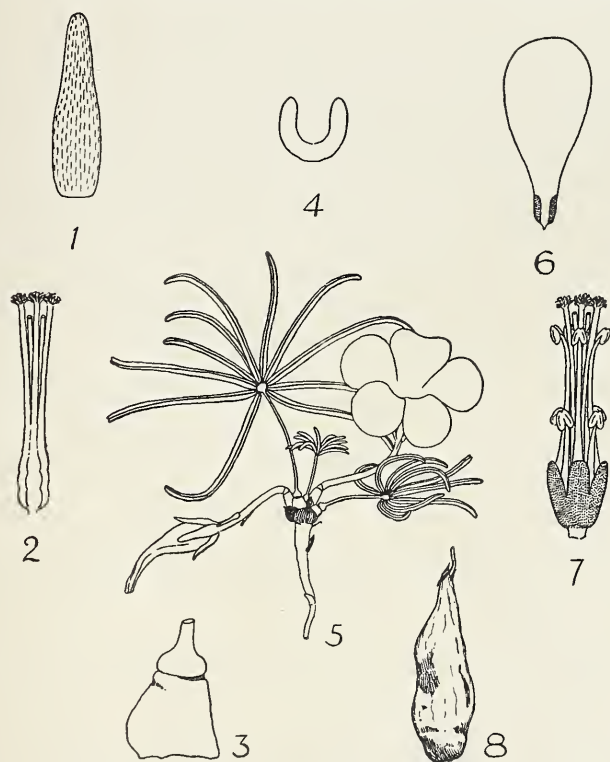


FIG. 38. *Oxalis pulvinata* Salter. 1. Sepal  $\times 4$ . 2. Gynaecium  $\times 5$ . 3. Base of petiole  $\times 5$ . 4. Cross section of leaflet  $\times 10$ . 5. Plant, natural size. 6. Petal  $\times 1\frac{1}{2}$ . 7. Androecium  $\times 5$ . 8. Bulb, natural size. (Salter 7340.)

tunics thin, soft, pale brown, or rarely splitting and forming a dense fibrous coating. *Rhizome* stout, usually long, with several conspicuous amplexicaul scales, often enclosed within a brown tunicaceous cortex. *Leaves* few or many, often spreading : petioles commonly 2—6 cm. long, dilated and scale-like below the basal articulation, swollen into a small

pulvinus at the apex, very rarely pilose with short patent pluricellular hairs: leaflets 2—12, (in Form G the juvenile leaf simple), sessile, often spreading palmately, linear, oblong, cuneate, cuneate-obovate or obovate, acute, obtuse or more rarely emarginate, often conduplicate-falcate, 1—5 cm. long, the margins sometimes more or less cartilaginous and rarely undulate, in Form G often purplish beneath. *Peduncles* 1-fl., shorter or longer than the leaves, with 2 alternate linear bracts near the calyx. *Sepals* ovate-lanceolate, oblong or ovate-oblong, acute or obtuse, 0.4—1 cm. long, often unequal in width, in Form D, 1—2 longer and subspathulate, very rarely glandular-ciliate, usually with several indistinct orange calli near the apex. *Corolla* 1.4—3 cm. long, yellow, white or very pale rosy-violet, with a rather broadly funnel-shaped yellow tube: laminae of the petals obovate, often purple on the outer margin beneath, rather longer than the attenuate claw. *Filaments* very minutely glandular-pilose, the shorter 2.5—4.5 mm., the longer 3.5—7.5 mm. long, with obtuse teeth. *Ovary* glabrous, the chambers 2—3 ovuled: styles glandular-pilose on the upper half. *Capsule* subglobular. Seeds without endosperm.

FORM A. Typical. *Leaflets* linear or oblong.

V.R.'s DORP DIV.; S. 701, 1706: CALVINIA DIV.; S. 2141, 2145, 4473, 5306: CLANW. DIV.; E. & Z. 748 (*O. pectinata*), *Schltr.* 7986, *B.H.* 14616, 19678, 19682, 19683, 19685, 19687, 22294, 22297, *Leipoldt* 433, *Pillans* 6659, S. 383/21, 692, 729, 2130: CERES DIV.; S. 2289, 6062: PRQB. DIV.; *Schltr.* 7917 (ex pte.): MALMESB. DIV.; *Bachmann* 1012 or 1812, *B.H.* 14549, 14551, *S.A.M.* 48355, S. 2165: WORCES. DIV.; S. 2180, 2182, 2188, 2189: TULBAGH DIV.; *Drège*, *Schltr.* 10486: CAPE DIV.; *Klipheuvcl*, *Drège* 3215: CAPE PENIN. E. & Z. 747, *Bolus* 4481, *B.H.* 22296, *MacO.* 1814, *Tyson* 6054, *Dummer* 1292, *Phillips* 232, S. 245/17, 505, 8084: RIVERSDALE DIV.; *Muir* 2532, S. 2293. Fl. May—June.

× FORM B. *Petioles* (and rarely peduncles) clothed with short pluricellular hairs.

CLANW. DIV.; S. 2138 (pale rose): CALVINIA DIV.; S. 4443 (dwarf, corolla rose).

× FORM C. *Leaves* linear-oblong. Intermediate between *O. flava* L. and *O. lupinifolia* Jacq. (Form E.).

V.R.'s DORP DIV.; S. 5336: CLANW. DIV.; *Mader* 2145: CERES DIV.; *B.H.* 22295: LAINGSBURG DIV.; *B.H.* 14507: NAMAQUALAND; S. 858, 2560, 6664.

✓ FORM D. *Sepals*, one or two spathulate or oblong, obtuse, longer and broader than the remainder.—*O. flabellifolia* Jacq.

V.R.'s DORP DIV.; *Zey.* 231 (ex pte.), S. 5334, 5344A, 5344B: CLANW. DIV.; E. & Z. 746, S. 375/19A, 682, 689. Fl. May.



× FORM E. *Leaflets* 3—8, obovate or cuneate-obovate, acute, rounded or slightly emarginate at the apex, more or less cartilaginous and sometimes undulate on the margins.—*O. lupinifolia* Jacq.

V.R's DORP DIV. ; *Zey.* 231 (ex pte.), *S.* 1705, 5337 : CLANW. DIV. ; *B.H.* 22293 (ex pte.), *S.* 725, 736 : CALVINIA DIV. ; *S.* 4446, 5374, 5380, 5381 ; PIQBG. DIV. ; *Schltr.* 7917 (ex pte.), *Pillans* 6678, *S.* 661, 662 : CERES DIV. ; *Burke & Zey.* 263, *Marl.* 9079 : LAINGSBURG DIV. ; *B.H.* 14507 : WORCES. DIV. ; *B.H.* 21355, *S.* 2193, 2201, 2202, 2311 : CAPE PENIN. between Constantia Nek and Hout Bay, *Schltr.* 783 (Berlin 993).

× FORM F. *Petiole* with narrow cartilaginous margins. *Leaflets* often with undulate margins. *Corolla* yellow or pale mauve. *Bulb* comparatively shallow, not producing a specialised descending root : tunics numerous, fibrous, splitting.

CLANW. DIV. ; *S.* 5390, 5391, 8241, *B.H.* 19688, 19696, 22293 (nearest to *O. lupinifolia*), *B.H.* 19684 (with characters of *O. lupinifolia* and *O. flabellifolia*).

A very variable form.

× FORM G. Juvenile leaf simple. *Petiole* without wings : leaflets 1—5, rarely 6, with cartilaginous margins. *Corolla* yellow.

(i) Leaflets cuneate or oblanceolate, coriaceous.

MALMESB. DIV. ; Langebaan, *S.* 3016, 5998, probably *E. & Z.* 745 (*O. lupinifolia*), Hopefield, *Bachmann* 996 or 1796, *S.* 8637.

(ii) Leaflets broadly cuneate to suborbicular, thinner in texture.

CLANW. DIV. ; *S.* 2599, 3515, 7516 : PIQBG. DIV. ; *B.H.* 14594.

Perhaps intermediate with *O. fabaefolia* Jacq., Form B (*O. asinina*). (See introduction to § Crassulae).

FORM H. *Leaflets* linear. *Bulb* comparatively shallow, not producing a descending specialised root : tunics numerous, fibrous, splitting. A mountain form.

V.R's DORP DIV. ; Van Rhyn's Pass, *Pillans* 6633, *S.* 703, 703A, 1610, 1610A, 4476 (leaflets 2—4 only), Nieuwoudtville, *S.* 5362, Gift Berg, *S.* 7290.

A variable group-species, common in the western coastal belt and consisting of many micro-varieties. The specimens cited here have been grouped under the Forms A to H, each showing some more or less salient character, but there is some overlapping and the grouping cannot be considered of definite taxonomic value.

In most of the Forms plants with the white or pale rosy-violaceous corolla are nearly as common as those with the yellow, the two colours sometimes growing in separate colonies or districts, but just as often in association. The width of the leaflets varies considerably under different epharmonic conditions and often increases considerably after the flowering

period. *O. pectinata* Jacq., usually with longer leaflets, is a very slight variant.

Although there is a general tendency towards the production of more leaflets in the Forms where the leaflets are narrow, it has not been found possible to co-ordinate the number of leaflets, which varies on the same plant, with any other constant characters. In the colony *S.* 4476, near Nieuwoudtville, with linear leaflets, the leaflets varied from 2—4 only on all the plants, but very similar colonies occur in the same district with a more normal number.

The specimens cited under Form C. are on the border line between *O. flava* and *O. lupinifolia*. Of those under Form D. (*O. flabellifolia*), disregarding the inconstant and monstrous character of the unequal sepals, which occur in other species, some are nearer to *O. flava* and some to *O. lupinifolia*. The sepals are not necessarily recurved as figured by Jacquin. (See Introduction, Part IX, Teratology).

Certain forms with cartilaginous-winged petioles (Form F.), though differing considerably among themselves, show a tendency to merge into Form B. of *O. fabaefolia* Jacq.

The specimens cited under Form G., although their petioles are not winged, are known to produce simple juvenile leaves and are also possibly related to *O. fabaefolia*.

The variation of the bulbs in *O. flava* is fully described in Part XII, sect. (i), of the Introduction, The Bulb and System of Vegetative Reproduction.

Of the glandular ciliation of the sepals of *O. flava*, as figured by Jacquin in Oxal. t. 72, the only trace I have seen is on a few of the specimens in the set *S.* 703A, and even there it is very scanty.

77  
115. *O. flaviuscula* Salter, Journ. of S.A. Bot. I (1935) 132. Dwarf, stemless, patent-puberulous, rarely glabrescent or glabrous, up to 3·5 cm. high. *Bulb* lanceolate in outline, often tortuous, shortly and acutely beaked, with brown undulate, papery tunics. *Rhizome* 32 cm. long (or longer), very slender below, enclosed in a loose, brown, papery cortex, with amplexicaul scales on the upper part. *Leaves* 5—27 : petioles 0·5—2 cm. long, often slightly flattened, green, widened and pulvinate at the apex : leaflets 5—9, shortly petiolulate, linear-oblong, sometimes slightly cuneate, conduplicate-falcate, obtuse, 0·7—1·6 cm. long, 2—3 mm. broad, the medial nerve conspicuous, narrowly cartilaginous at the margins, glabrous above, ciliate, usually inconspicuously brown-dotted, particularly near the apex. *Peduncles* 1-fl., 0·5—1·5 cm. long, with 2 alternate linear orange-callose bracts a little below the calyx. *Sepals* ovate-lanceolate, acute, usually attenuate, ciliate, with elongate orange calli along the margins, sometimes narrowly purple-margined

on the lower half. *Corolla* 1·2—2·2 cm. long, yellow, with a short broadly funnel-shaped concolorous tube: petals broadly cuneate-obovate, attenuate to a short, broad claw, obliquely subtruncate at the apex, 0·7—

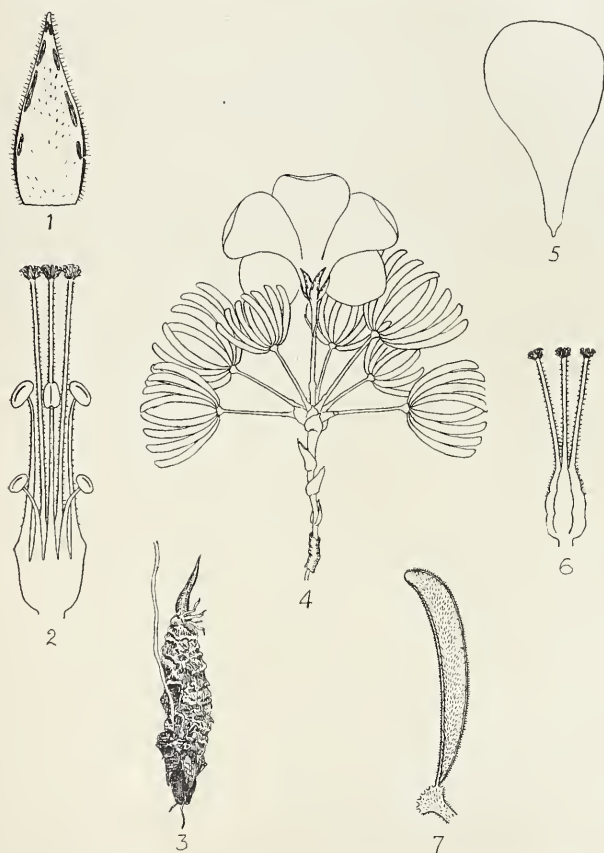


FIG. 39. *Oxalis flaviuscula* Salter. 1. Sepal  $\times 6$ . 2. Androecium  $\times 6$ . 3. Bulb, natural size. 4. Plant, natural size. 5. Petal  $\times 1\frac{1}{2}$ . 6. Gynaecium  $\times 6$ . 7. Leaflet folded, under side  $\times 3$ . (Salter 5524.)

1·2 cm. broad. *Filaments*, the shorter 2·5—5 mm., the longer 5—9 mm. long, sparsely and minutely glandular-pilose, slightly gibbose. *Ovary* glabrous or near the apex, like the styles, shortly pilose with

pluricellular hairs, the chambers 2—3-ovuled. *Capsule* subglobose. Seeds without endosperm. (Fig. 39.)

NAMAQUALAND; Steinkopf, in gravel on the golf links *S.* 5524 (type in Bol. Herb.), 896, 4578. Fl. June.

Var. *β longifolia* Salter, loc. cit. *Petioles* terete, reddish-brown. *Leaflets* 5—7, 1·3—3·8 cm. long, narrower. *Corolla* pale yellow: petals sometimes purple-striate on the margin beneath.

NAMAQUALAND; 9 miles north of Kamieskroon, *S.* 2563 (type in Bol. Herb.), 1410A (cult.), 4575, 5566, Steinkopf, *M. Schlechter* 72. Fl. June—July.

The typical form has remained more or less normal in cultivation under the less arid conditions of the Cape Peninsula, but var. *β* has increased considerably in size, with leaflets up to 7 cm. long and the corolla 2·7 cm. long. It is very distinct and perhaps worthy of specific

\* *O. logani* MS rank.

\* 116. *O. namaquana* Sond., Fl. Cap. I (1860) 325. Rather robust, 4—20 cm. high, entirely glabrous, the stem sometimes shortly exerted. *Bulb* ovoid, acute or subrostrate at the apex, up to 2·5 cm. long: tunics rather thin, blackish, easily separable, or pale brown on the younger bulbs. *Rhizome* usually thick in the upper part, 20 cm. long or more, with large amplexicaul scales. *Stem* not exerted or up to 10 cm. long, sometimes with a few scales, or in shade plants leafy. *Leaves* often numerous, rosulate or more or less loosely imbricate on the stem: petioles 2—11 cm. long, broadly dilated, scale-like, brown and nerved below the basal articulation: leaflets 3, shortly petiolulate, linear or oblong, tapering at the base, incised at the apex, sometimes conduplicate, 1·2—2·7 cm. long, 2—7 mm. broad, with 2 small, brown apical calli. *Peduncles* 1-fl., terminal, 2—12 cm. long, with 3 large oblong-lanceolate carinate bracts closely adpressed to the calyx. *Sepals* oblong-lanceolate, somewhat obtuse, 7—11 mm. long, usually ecallose. *Corolla* 2—3 cm. long, bright yellow, with a short, broad tube: laminae of the petals obliquely cuneate-obovate, subtruncate, 1—1·7 cm. broad, 4—5 times longer than the attenuate claw. *Filaments* glandular-pilose, the shorter 2·5—4·5 mm., the longer 5·5—7·5 mm. long, with short, rather obtuse teeth. *Ovary* glabrous, the chambers 2—3-ovuled: styles densely glandular-pilose. *Capsule* subglobose, shorter than the calyx. Seeds without endosperm.

NAMAQUALAND; Drège, between Uitkomst and Geelbeekskraal (*O. flava* L., var. *trifoliata* E. Mey. M.S., type), *Bolus* 6654, *Schltr.* 11133, *Pearson* 6493, *B.H.* 19193, 21876, *Marl.* 6711, *S.* 819, 833, 2553, 3815: V. R's DORP Div.; Aties, *Marl.* 6711, *S.* 5495. Fl. May—Sep.

Variable in size. It frequents the borders of seasonal streamlets



and dampish places where it often produces a short stem, but it is occasionally found on open, dry ground, where the plants are smaller, stemless, more compact and often densely leafy.

117. *O. Louisae* Salter, Journ. of Bot. LXX (1932) 282. Stemless, rather succulent, 5—14 cm. high, entirely glabrous. *Bulb* obclavate, up to 7 cm. long : tunics loose, light brown, papery, transversely wrinkled, with a smooth, linear-lanceolate acute beak at the apex. *Rhizome* 25 cm. long or more, thick in the upper part, at length bearing numerous large, elongate bulbils on short, underground stolons arising from the scale axils. *Leaves* 10—30 or sometimes very numerous : petioles flattened, up to 4 cm. long, dilated and nerved below the basal articulation : leaflets 3, articulated to the petiole, bright green, sometimes inconspicuously black-dotted, the medial cuneate, obcordately incised at the apex, 1.5—2.4 cm. long, 0.7—1.2 cm. broad, the lateral somewhat oblique, rather smaller. *Peduncles* 1-fl., 1—3.5 cm. long, with 2 linear-lanceolate bracts, 4 mm. long, close to the calyx. *Sepals* lanceolate or oblong-lanceolate, 7—8 mm. long, ecallose. *Corolla* 2.5—3.5 cm. long, pale cream-coloured, with a broadly funnel-shaped yellow tube : laminae of the petals cuneate-obovate, subtruncate, 3—4 times longer than the tapering claw. *Filaments* sparsely glandular-pilose, the shorter 4—5.5 mm., the longer 6—10 mm. long, with short, obtuse teeth. *Ovary* oblong, 3 mm. long, sparsely glandular-pilose at the apex, the chambers 3-ovuled : styles minutely glandular-pilose.

NAMAQUALAND ; Kamieskroon, S. 818 (*type* in Bol. Herb.), 2557, 3709, 4572, 5569, *L. Bolus* (B.H. 19528, leaves only). Fl. May—June.

118. *O. Salteri* L. Bolus, Journ. of Bot. LXVIII (1930) 75. Stemless, rather robust, up to 16 cm. high, entirely glabrous. *Bulb* globose-conical, often deformed, attenuate-acute at the apex, about 2 cm. long, with rather hard pale brown tunics. *Rhizome* 30—40 cm. long or more, with a brown tunicaceous cortex, very slender towards the base. *Leaves* 4—13, simple, procumbent, with petioles 3—5 mm. long : lamina sub-orbicular, broadly elliptical or ovate, sometimes very slightly incised at the apex, usually 2—4 cm. long, somewhat glaucous-green above, rich brownish-purple beneath. *Peduncles* several, 1-fl., 5—14 cm. long, with 2 alternate bracts on the upper half. *Sepals* broadly lanceolate, 5—7 mm. long, often dark-edged, sometimes indistinctly callose towards the apex. *Corolla* 1.8—3.5 cm. long, yellow or more rarely white, the yellow funnel-shaped tube often purple-streaked about the throat : laminae of the petals obliquely cuneate-obovate, very obliquely subtruncate, rather longer than the tapering claw. *Filaments* sparsely glandular-pilose, the shorter 3.5—5 mm., the longer 5.5—9 mm. long, edentate. *Ovary* oblong, 2.5—3 mm. long, glabrous, with numerous

elongate orange striae and dots on the upper part, the chambers 5—6-ovuled: styles with a few simple hairs at the base, shortly glandular-pilose above. *Capsule* elongate, twice as long as the sepals. Seeds without endosperm.

V. R's DORP Div.; between V. R's Dorp and Klaver, *Salter* (B.H. 18937, type in Bol. Herb.), *Pillans* 6665, 6666, *S.* 375/17, 695, 719, 5303A, 5303B, 7255, between V. R's Dorp and V. R's Pass, *Pillans* 6667, 6668, *S.* 710, 715, 5316, 7316, *Masson* (without flowers) in Brit. Mus. Herb. Fl. May—June.

Both colour forms often grow in association, but the yellow form is much more plentiful than the white in most colonies. In favourable seasons it is sometimes abundant in slight depressions where the water collects after rain. Plants with flowers of both colours, growing in dry situations, particularly north of Van Rhyn's Dorp, are usually smaller in all parts and the leaves more ovate, but there appears to be no varietal distinction.

#### Sect. K. ANGUSTATAE.

Leaflets 3—many, usually narrow; linear, oblong or narrowly cuneate. Peduncles axillary or subterminal. Stem normally more or less exserted. Seeds without endosperm. Plant not fleshy as in Section J, *Crassulae*.

*Some exceptions with broader leaflets or with the stem not exserted are specified in the headings to the sub-sections.*

#### SUB-SECT. (i). PARDALES.

Leaflets linear or linear-cuneate, streaked with short pellucid lines: sepals striate with pellucid lines. These lines turn black in the dry state. Bulb tunics lanceolate, ligulate or linear, usually sharply acute or needle-pointed, at least the outer clothed with retrorse hairs. Leaflets 3 (except in *O. capillacea*, typica 5—9). Peduncles axillary or terminal. (*Sp.* 119—129).

A distinct natural section. Many of the species resemble one another closely. *O. capillacea*, previously included in § Multifoliolatae, has a 3-foliolate form. Some of the other species are taken from the § Sessilifoliae, but the majority are of recent discovery.

(See group 13 in *Analysis of the Species*).

119. *O. capillacea* E. Mey. ex Sond., Fl. Cap. (1860) 435.—*O. capillacea* E. Mey ex Sond., vars. *Meyeri* Sond., *major* Sond. and *glabra* Sond. Slender, erect caulescent, or more rarely with the stem slightly exserted, often 6—14 cm. high, pubescent or almost entirely glabrous. *Bulb*

lanceolate in outline, often contorted: tunics lanceolate, splitting at the base, brown, paler at the margins, pilose with retrorse coppery hairs. *Rhizome* often 10—15 cm. long. *Stem* up to 10 cm. long, sometimes branching from the base, with several semiamplexicaul scales or rarely 1—2 subsessile leaves. *Leaves* terminally clustered or closely imbricate, much enlarged after the flowering period: petioles filiform: leaflets 5—9 (often 7), sessile, linear or linear-cuneate, tapering at the apex, emarginate, 0.5—1.5 cm. long, often conduplicate or involute, glabrous above, with numerous linear pellucid streaks which become black in drying. *Peduncles* 1-fld., terminal or axillary in the upper stem scales, 2—9 cm. long, twice as long as the leaves or longer, with 2 linear striate bracts near the calyx. *Sepals* lanceolate or linear-lanceolate, 3—6 mm. long, ciliate, longitudinally striate with pellucid lines (black in drying). *Corolla* 1—2 cm. long, white, yellow or rose, with a rather widely funnel-shaped yellow tube: petals 6—8 mm. broad, particularly in the white-flowered form conspicuously purple-margined beneath. *Filaments*, the shorter 2—3 mm., the longer 3—6 mm. long, unequal, minutely glandular, sometimes slightly gibbose. *Ovary* callose, pilose on the upper half, the chambers 2—5-ovuled: styles usually pubescent below, glandular-pilose above. *Capsule* not exerted. Seeds without endosperm.

FORM A. Corolla white: petals usually purple-margined below.

WORCES. DIV.; Hex River ?\* *Burke & Zey.* 251 (type in Herb. Sond.). PIQBG. DIV.; Krumm Riv., *Zey.* 213 (var. *glabra* Sond.), *S.* 2423, 2610, 2611: TULBAGH DIV.; *Schltr.* 7846, *Guthrie* 2989, *S.* 2233, 2274, 2280, 5410, 6081, 8120: Loc ? *Leipoldt* (B.H. 19743, 19755, 19756, 19777, 20419: ROBERTSON DIV.; *Galpin* 9957. Fl. May—July.

FORM B. Corolla rose.

CERES DIV.; Theron's Berg, *S.* 2106, 2214, between Rietvlei and Hartebeest Kraal, *B.H.* 22598. Fl. Apl.—May.

FORM C. Corolla yellow.

Breede River ? *Zey.* 259 (var. *major* Sond.): CERES DIV.; *B.H.* 19709, 22600, *S.A.M.* 48353, *S.* 2110, 2112, 2216, *Kirstenbosch* 735/37: LAINGSBURG DIV.; *S.* 6056. Fl. Apl.—June.

\* Var. *ternata* Salter var. nov. *Foliola* 3. *Corolla* 1.5—1.9 cm. longa.

Leaflets 3. Leaves sometimes more loosely imbricate on the upper part of the stem, the peduncles more distinctly axillary. *Corolla* 1.5—1.9 cm. long, pale rose with a yellow tube: petals about 1 cm. broad, with reddish-purple outer margins.

CALEDON DIV.; 9 miles east of Caledon, *S.* 6697 (type in Bol. Herb.).

A variable and widely distributed species. It is not advisable to

\*See Introduction Part III. Errors in Zeyher's localities.

separate the three colour Forms A, B and C as varieties, though it is easy to understand that Sonder, to whom only 4 collectings were known, imagined that his varieties were constant. The characters by which he distinguished them are, however, of no real value, for the variations in the indument and the epharmonic differences in the size of the plants, leaves and flowers are most marked in this species.

Var. *ternata* approaches nearly to *O. leptogramma* Salter, but it is more robust and has not the typical short broad sepals of that species. Many of the multifoliolate species have 3-foliolate forms and it may eventually be found that the two species merge into one another.

\* 120. *O. leptogramma* Salter, Journ. of S.A. Bot. II (1936) 147. (*O. Burkei* Sond., var. *multiglandulosa* Sond.) Slender, caulescent 5—12 cm. high. *Bulb* lanceolate in outline, sharply acute at the apex, 3—4 cm. long: tunics lanceolate or ligulate, attenuate, needle-pointed, shining, brown, the outer pilose with retrorse coppery hairs, particularly near the base and apex. *Stem* slender, rigid, up to 7 cm. long, minutely viscoso-pilose, reddish-brown, with a few scales or abortive leaves. *Leaves* up to 12, or rarely more numerous, apically congested or rather densely imbricate, glabrous or rarely sparsely pubescent: petioles filiform, often 2 cm. long, reddish-brown: leaflets 3, sessile, narrow-linear, conduplicate or involute, emarginate, sometimes slightly falcate, sprinkled with numerous small pellucid streaks which become black in drying. *Peduncles* 1-fl., apical or rarely arising from the cauline scales, a little longer than the leaves, reddish, with 2 small alternate subulate striate bracts near the apex. *Sepals* narrowly ovate or obovate, acute, 2—3 mm. long, crispate-ciliate on the upper half, longitudinally striate with pellucid lines (black in drying). *Corolla* 1.6—1.9 cm. long, coppery-rose or rosy purple, with a rather widely funnel-shaped yellow tube: laminae of the petals broadly obovate, 8—10 mm. wide, pellucid-striate near the margin, tapering to a short cuneate-attenuate claw. *Filaments*, the shorter 2—3 mm., the longer 3—5.5 mm. long, glandular-pilose, unequal, sometimes slightly gibbose. *Ovary* pubescent and callose on the upper part, the chambers 2—3-ovuled: styles pubescent below, glandular-pilose above. Seeds without endosperm. (Fig. 40.)

WORCES. DIV.; near Orchard Station, S. 2178 (type in Bol. Herb.), 6045, near Brand Vlei, S. 6040, Driekop, Zey. 256 (*O. Burkei* Sond., var. *multiglandulosa* Sond.); near Berg River?, \* Zey. 252: CERES Div.; B.H. 19716, 19717, 19719, 20117. Fl. May—June.

Var.  $\beta$  *brevifolia* Salter, loc. cit. *Stem* shorter. *Leaves* much shorter. *Corolla* rose-purple or white: petals narrower.

WORCES. DIV.; Quarri Siding (rose-purple), S. 2208 (type), 6052,

\*See Introduction, Part III, Errors in Zeyher's localities.



foot of Hex River Pass, *S.* 6047 (*white*) near Constable, *S.* 2203, Pinaar's Kloof, *S.* 6066.

✕ Var.  $\gamma$  ***lutea*** Salter, loc. cit. *Stem* short. *Leaves* shorter. *Peduncles* much longer than the leaves. *Corolla* yellow: petals subcuneate, slightly attenuate to the base.

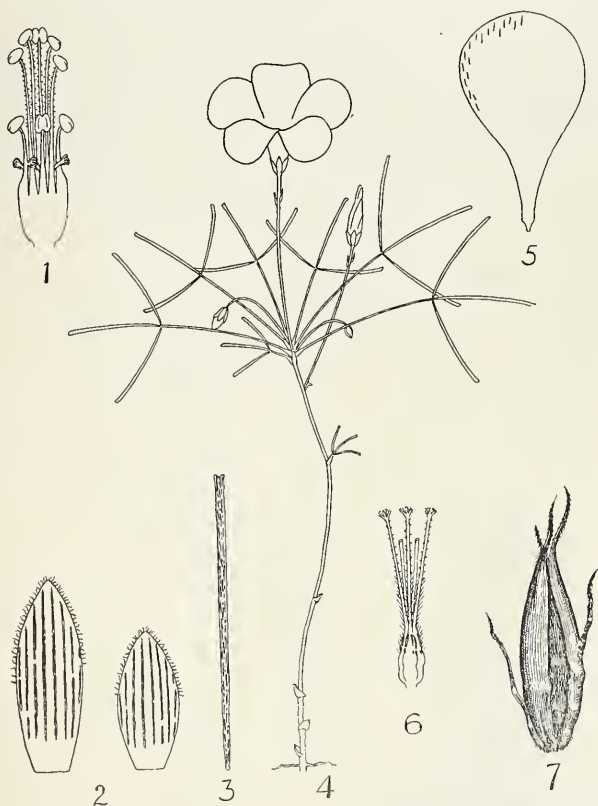


FIG. 40. *Oxalis leptogramma*, Salter. 1. Androecium  $\times 6$ . 2. Sepals (dried)  $\times 10$ . 3. Leaflet (dried)  $\times 3$ . 4. Plant, natural size. 5. Petal  $\times 2$ . 6. Gynaecium  $\times 6$ . 7. Bulb, natural size (Salter 2178).

MONTAGU DIV.; near Montagu, *S.* 2316 (*type*), 2321, 6076, *B.H.* 20102.

Zeyher's specimens of the typical form are very poor, starved and without bulbs. Sonder's error in placing them as a variety of *O. Burkei*

Sond., a species with an entirely different bulb and without the pellucid streaks of this Subsection is perhaps excusable.

(See note on var. *ternata* of the foregoing species.)

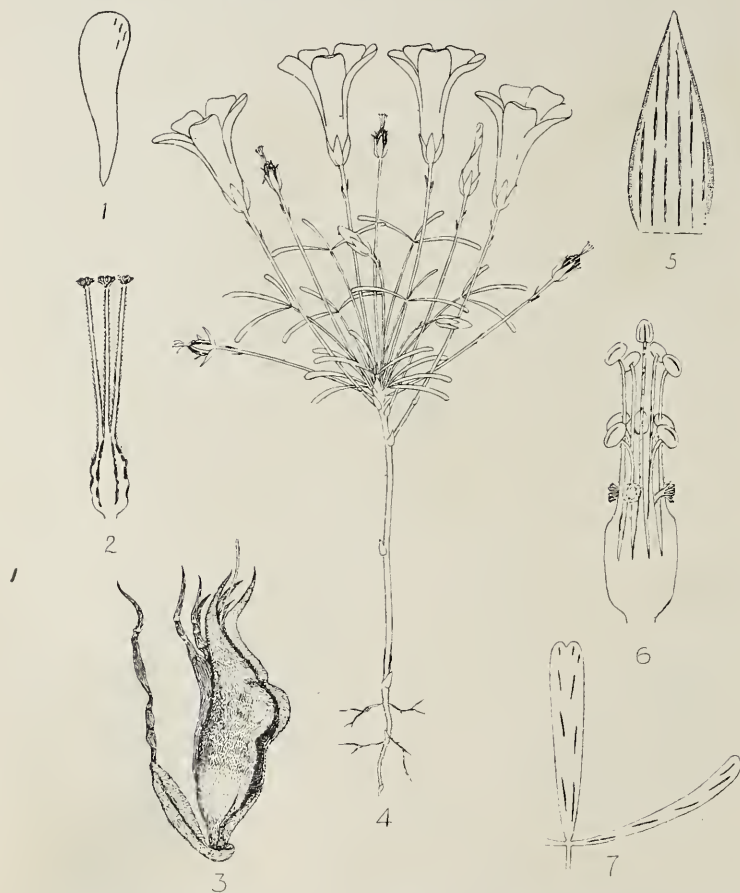


FIG. 41. *Oxalis lineolata* Salter. 1. Petal  $\times 2$ . 2. Gynoecium  $\times 8$ . 3. Bulb, natural size. 4. Plant  $\times 1\frac{1}{2}$ . 5. Sepal (dried)  $\times 10$ . 6. Androecium  $\times 8$ . 7. Leaf (dried)  $\times 5$ . (Salter 5382.)

- \* 121. *O. lineolata* Salter, Journ. of S.A. Bot. II (1936) 1. Small, caulescent, 5–8 cm. high. *Bulb* elongate, distorted, attenuate at the apex, 3–4.5 cm. long, loosely coated with numerous sharply acute

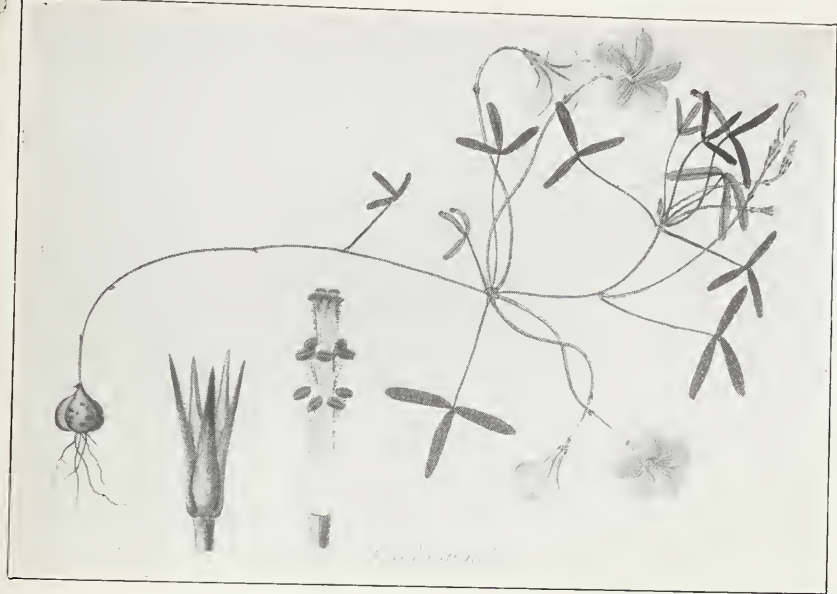
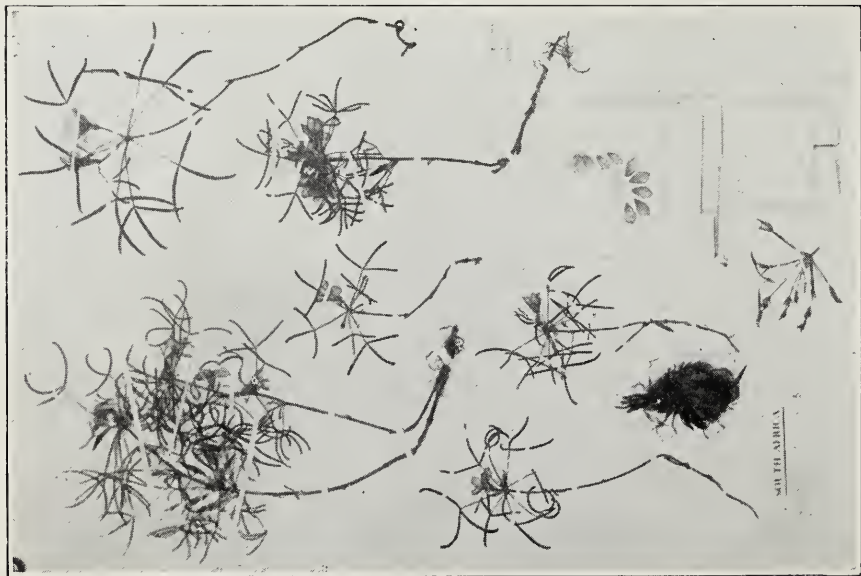


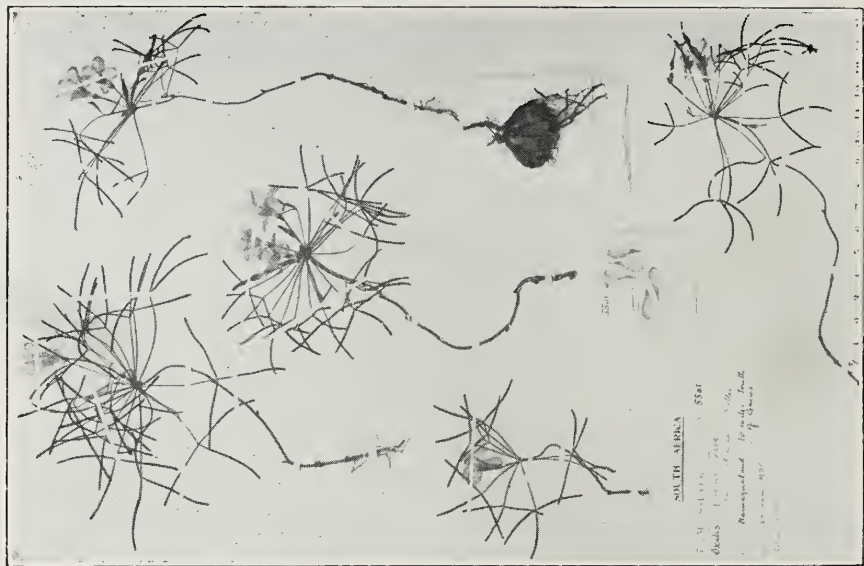
PLATE VII.

- (i) *O. gracilis* Jacq. (from Jacquin's *Oxalis*, tab. 33), grown in Vienna.  
 (ii) Wild specimens (Salter 674).

[Photo : R. S. Adamson.]



(i) *O. gracilis* Jacq., var. *purpurea* Salter. (Salter 3406.)



(ii) *O. gracilis* Jacq., var. *filacea* Salter. (Salter 5501.)  
[Photo: R. S. Adamson.]



retroresely velvety tunics, the outer often splitting. *Rhizome* slender, 8—10 cm. long, shortly glandular-pilose. *Stem* 1—5 cm. long, dark green, sparsely glandular-pilose, with 2—6 brown cuspidate scales. *Leaves* 10—20, apically congested: petioles 0.5—1.5 cm. long, sparsely glandular-pilose: leaflets 3, sessile, linear or narrowly linear-cuneate, falcate, conduplicate or involute, emarginate, 4—9 mm. long, glabrous, with a few pellucid streaks which turn black in drying. *Peduncles* 1-flid., rather numerous, apical, 1.5—2 cm. long, or if arising from the upper cauline scales, rather longer, with 2 minute alternate subulate callose bracts near the calyx. *Sepals* broadly lanceolate or ovate-lanceolate, longitudinally striate with pellucid (or when dry) black lines, ecallose, often with violaceous membranous margins. *Corolla* 1—1.6 cm. long, white, with a funnel-shaped yellow tube: petals somewhat ascending, cuneate, rounded at the apex, longitudinally concave, up to 3.5 mm. broad, with linear calli along the margin. *Filaments*, the shorter 2—3.5 mm., the longer 3—5 mm. long, sparsely glandular-pilose on the outer edge, slightly gibbose. *Ovary* pubescent on the upper half, dotted with numerous calli, the chambers 3-ovuled: styles pubescent below, glandular-pilose above. *Capsule* ovate-oblong, callose, scarcely exerted. Seeds without endosperm. (Fig. 41.)

CLANW. DIV.; near Doornbosch in dry shale flats, *S.* 5382 (type in Bol. Herb.), 2473 (cult.), 4442, 4548, 5384. Fl. May—June.

122. *O. Massoniana* Salter, Journ. of S.A. Bot. II (1936) 3. Small, erect, caulescent, cano-pubescent, often caespitose, 4—6 cm. (in shade up to 24 cm.) high. *Bulbs* congested, often 2 cm. long, the older persisting on the rhizome in moniliform series: tunics thin, retroresely pilose, the inner lanceolate, sharply acute, brown, shining, the outer loose, linear, conspicuously plicate, dark brown. *Stem* simple, 2—4 cm. long, red, with a few scales towards the base, densely leafy above. *Leaves* cauline, glaucous, the upper subsessile, the lower shortly petiolate: petioles scale-like, striate, 0.5—1 mm. long: leaflets 3, sessile, linear, obtuse, with involute margins, sometimes conduplicate, about 5 mm. long, 1 mm. broad, glabrous above, pilose below, ciliate, sprinkled with small pellucid streaks which turn black in drying. *Peduncles* 1-flid., slender, axillary, 2—3 cm. long, reddish-brown, with 2 alternate subulate reddish striate bracts, 2—3 mm. long on the upper part. *Sepals* broadly lanceolate, 4—5 mm. long, ciliate, reddish, striate with pellucid (or when dry) black lines. *Corolla* 1.6—1.8 cm. long, the funnel-shaped tube, like the throat yellow: petals cuneate-obovate, attenuate at the base, rounded at the apex, 7—9 mm. broad, the upper part (1/3) brick-red, the lower (2/3) yellow, sparsely pubescent and striate near the margin. *Filaments*, the shorter 1.8—3 mm., the longer 3—6 mm. long, sparsely glandular-pilose towards the apex, scarcely gibbose. *Ovary* glabrous or

pubescent on the upper part, dotted with numerous calli, the chambers 1-ovuled: styles sparsely pubescent with a few capitate hairs admixed. Seeds without endosperm. (Fig. 42.)

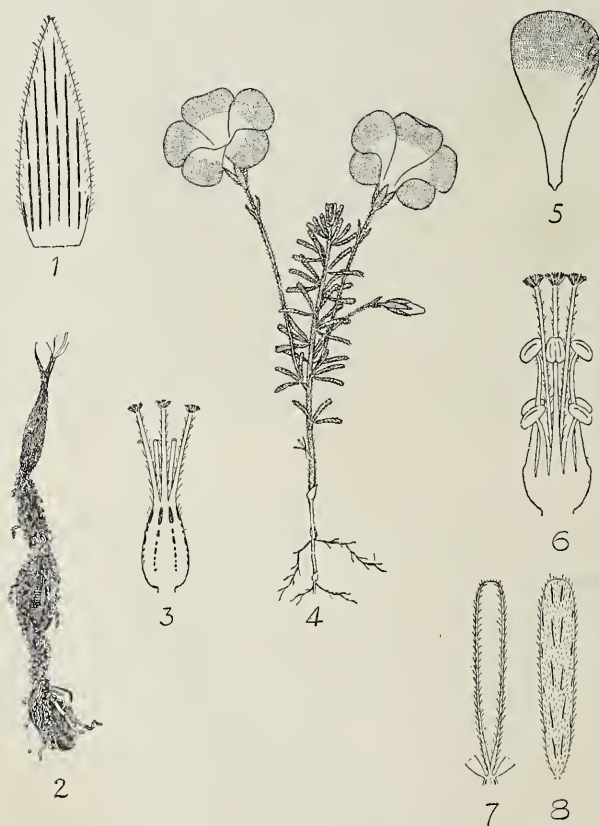


FIG. 42. *Oxalis Massoniana* Salter. 1. Sepal (dried)  $\times 8$ . 2. Bulb, natural size. 3. Gynaecium  $\times 8$ . 4. Plant, natural size. 5. Petal  $\times 1\frac{1}{2}$ . 6. Androecium  $\times 8$ . 7. Leaflet upper surface  $\times 5$ . 8. Leaflet flattened out, under surface (dried)  $\times 5$ . (Salter 5360.)

CALVINIA DIV.; in damp, muddy, shallow soil overlying flat rock at summit of Van Rhyn's Pass, *S.* 705 (*type* in Bol. Herb.), 1607 (cult.), 2144, 5360, *Pillans* 6644. Fl. May.

\* Var.  *$\beta$  flavescens* Salter, loc. cit. Plant more robust, the stem often bifurcate at the base. *Peduncles* numerous. *Corolla* pale straw-yellow,

conspicuously black-striate and purple-maculate near the outer margin. *Ovary* chambers 2—3-ovuled.

CALVINIA DIV. ; 7 miles east of Nieuwoudtville in hard, clayey soil, S. 4474 (*type*) and cult., 7 miles north of Nieuwoudtville, S. 4566. Fl. June.

The extension of the yellow colour of the corolla tube well into the lamina of the petal is a very rare feature in the genus and is only known in one other species, viz. *O. ciliaris* Jacq., var. *Pageae*. From the disposal of the old bulbs along the rhizome it would appear that it has a contractile root.

This species is perhaps the most strikingly handsome of all the South African *Oxalis* and I have named it in honour of Francis Masson, who first collected and sent to Banks a flowerless specimen (now in Brit. Mus.) of the *Oxalis* which now bears my own name (*O. Salteri* L. Bolus), described and named before the existence of Masson's flowerless specimens was known.

Var.  $\beta$  is perhaps a distinct species.

✕ 123. *O. melanograpta* Salter, Journ. of S.A. Bot. II (1936) 5. Dwarf, caulescent, 2—4 cm. high. *Bulb* narrow-ovoid, with the tunics, often 2.5 cm. long : tunics numerous, loose, lanceolate or ligulate, attenuate, needle-pointed, brown, shining, the outer with inconspicuous brown retrorse hairs. *Rhizome* 5—8 cm. long, pilose. *Stem* up to 2.5 cm. long, glabrous or pubescent towards the base, with 1—4 scales on the lower half, densely leafy above. *Leaves* numerous, closely imbricate on the upper half of the stem, erecto-patent, with scale-like petioles 0.5—1 mm. long : leaflets 3, very shortly petiolulate, linear, conduplicate or involute, often falcate, emarginate, 3—7 mm. long, 0.6—1.2 mm. broad, glabrous, sprinkled with small pellucid streaks which turn black in drying. *Peduncles* 3—14, 1-fl., axillary, sparsely and minutely glandular-pilose, reddish-brown, with 2 subopposite lanceolate keeled reddish glandular-ciliate striate bracts a little below the calyx. *Sepals* narrow-ovate or ovate-lanceolate, 2.5—3 mm. long, conspicuously glandular-ciliate on the upper half, longitudinally striate with pellucid (or when dry) black lines. *Corolla* 1—1.4 cm. long, rose-red, with a short broadly funnel-shaped yellow tube : petals rather broadly cuneate, slightly attenuate to the base, often subtruncate at the apex, 5—8 mm. broad, striate near the outer margin. *Filaments*, the shorter 2—3.5 mm., the longer 3.5—7 mm. long, glandular-pilose on the outer edge, scarcely gibbose, the longest well exerted from the corolla tube. *Ovary* sparsely pilose at the apex, with numerous calli, the chambers 2—3-ovuled : styles glabrous below minutely glandular above. *Capsule* globose. Seeds without endosperm. (Fig. 43.)

V.R.'s DORP Div. ; in shale on a low kopje 18 miles north-east of V.R.'s Dorp, S. 714 (type in Bol. Herb.) 2491, 5322, *Pillans* 6664. Fl. May—July.

Apparently very local and growing in association with *O. deserticola*



FIG. 43 *Oxalis melanograpta* Salter. 1. Gynaecium  $\times 6$ . 2. Sepal  $\times 12$ . 3. Petal  $\times 3$ . 4. Plant  $\times 2$ . 5. Leaflet (dried)  $\times 4$ . 6. Androecium  $\times 6$ . 7. Bulb tunics, natural size. (Salter 5322.)

Salter, another species which is, as far as is known, confined to the same small kopje.

124. *O. camelopardalis* Salter, Journ. of S.A. Bot. III (1937) 102. Erect, caulescent, up to 10 cm. high, entirely glabrous except for the ciliate sepals. *Bulbs* lanceolate in outline, often congested, 4—5 cm.

long : tunics loose, lanceolate or linear-lanceolate, sharply acute, brown, clothed with retrorse brown hairs, the inner paler, shining. *Rhizome* up to 10 cm. long, pilose. *Stem* up to 7 cm. long, sometimes branching, the greater part densely leafy up to the apex, but with a few more or less striate scales towards the base. *Leaves* numerous, densely imbricate, recurved : petioles subsquamiform, 1.5—2.5 mm. long, with 2 striae near the margins : leaflets 3, sessile, narrow-linear, falcate-conduplicate, minutely emarginate, 3—8 mm. long, sprinkled with small pellucid streaks which turn black in drying. *Peduncles* rather numerous, 1-fld., in the axils of the lower leaves, 2.5—7.5 cm. long, reddish, with 2 alternate or sub-opposite linear striate bracts a little below the calyx. *Sepals* broadly lanceolate, 4—5 mm. long, rarely minutely ciliate, striate with pellucid (or when dried) black lines. *Corolla* up to 2 cm. long, bright reddish-purple, with a funnel-shaped yellow tube : laminae of the petals sub-orbicular, slightly truncate at the apex, linear-striate near the outer margin, rather longer than the tapering claw. *Filaments*, the shorter 2—2.5 mm., the longer 3—4 mm. long, very sparsely glandular-pilose, slightly gibbose. *Ovary* glabrous or sparsely pubescent towards the apex, with numerous calli, the chambers 2—3-ovuled : styles sparsely pubescent below, glandular above. Seeds without endosperm.

CALEDON-WORCESTER DIVS. ; Rooihoogte Pass, *S.* 2308 (*type* in Bol. Herb.), 6039, *B.H.* 22448 : MONTAGU DIV. ; *Leipoldt* (*B.H.* 16061). Fl. June.

125. *O. confertifolia* (O. Kuntze) R. Knuth, Eng. Bot. Jahrb. LXI. Beibl. 139 (1937) 27.—*O. densifolia* Turcz.—*O. densifolia* Sond., non Mart. et Zucc. Erect, caulescent, 15—45 cm. high. *Bulbs* lanceolate in outline, often congested, 3—5 cm. long : tunics lanceolate or ligulate, needle-pointed, shining, brown, at least the outer clothed with retrorse hairs. *Rhizome* ligneous, glabrous, 4—10 cm. long. *Stem* up to 40 cm. long, robust, ligneous, leafy, often 2—3 mm. in diam. at the base, rarely branching, glabrous, with a few scales towards the base. *Leaves* cauline, numerous, extending nearly to the base of the stem, the lower pseudo-fasciculate, the upper closely alternate, imbricate, with squamiform petioles 1.5—3 mm. long : leaflets 3, linear, usually 0.5—1 cm. long, conduplicate, falcately recurved, emarginate, glabrous or sometimes sparsely villose beneath, copiously sprinkled with linear pellucid streaks which turn black in drying. *Peduncles* erect, often numerous, slender, glabrous, purplish-brown, in the upper leaf axils and often arising from the leaf-fascicles towards the base, 3—10 cm. long, with 2 alternate linear bracts on the upper part. *Sepals* lanceolate, acute, 4—6 mm. long, glabrous or sometimes minutely ciliate, striate with 8—10 pellucid (or when dried) black lines. *Corolla* 1.6—2.4 cm. long, deep rosy-purple, with a



funnel-shaped yellow tube: laminae of the petals obliquely obovate, slightly truncate, darkening and with pellucid streaks near the outer margin, a little longer than the narrow-cuneate claw. *Filaments*, the shorter 2.5—3.5 mm., the longer 3.5—6 mm. long, glandular-pilose, slightly gibbose. *Ovary* pilose on the upper half, callose, the chambers 5-ovuled: styles pilose below, glandular-pilose above. *Capsule* oblong, about 6 mm. long, slightly exserted from the calyx. Seeds without endosperm.

Loc. ? *Drège* 7426 (type in Herb. Sond.): RIVERSDALE DIV.; *Muir* 2632, *B.H.* 20106, 20118, *S.* 2383: SWELLENDAM DIV.; *B.H.* 20100, *S.* 2384, 2388, 8095. Fl. May—June.

*Drège's* specimens are poor and fragmentary.

\* Var.  $\beta$  *petiolata* Salter, var. nov. *Foliola* minus recurva, superiora erecta, petiolis ad 1.5 cm. longis.

RIVERSDALE DIV.; near Riversdale Station, *S.* 2380 (type).

Leaflets less recurved, the upper erect with petioles up to 1.5 cm. long.

This variety has retained its distinctive characters in cultivation.

\* Var.  $\gamma$  *lutea* Salter, var. nov. *Planta* minor, gracilior. *Caulis* 3—6 cm. longus. *Folia* dense sericeo-villosa. *Corolla* lutea.

CERES DIV.; between Rietvlei and Hartebeest Kraal, *Leipoldt* (*B.H.* 22594—type). Fl. May.

Plant smaller and more slender. *Stem* 3—6 cm long. *Leaves* densely silky-villose. *Corolla* yellow.

\* 126. *O. heidelbergensis* Salter, Journ. of S.A. Bot. II (1936) 6. Erect, caulescent, often tufted, entirely glabrous, 15—25 cm. high. *Bulbs* lanceolate in outline, often congested, up to 4 cm. long: tunics lanceolate or ligulate, with long attenuate acute tips, clothed with retrorse hairs, the outer splitting and twisted, forming a loose somewhat fibrous coating. *Rhizome* 10—15 cm. long. *Stem* subligneous, sometimes sparsely branched, with scales or abortive subfascicled leaves towards the base, densely leafy above. *Leaves* subsessile, imbricate, reflexed: petioles squamiform, 1—2 mm. long: leaflets 3, sessile, linear, involute or conduplicate, falcate, emarginate, 4—7 mm. long, 0.6—1 mm. broad, sprinkled with small pellucid striae which turn black in drying. *Peduncles* 1-flid., numerous, subequal, ascending, slender, axillary on the upper part of the stem, 3—4 cm. long, reddish-brown, with 2 alternate or sub-opposite linear-lanceolate bracts a little below the calyx. *Sepals* broadly lanceolate, 4—5 mm. long, longitudinally striate with pellucid (or when dried) black lines. *Corolla* 1.5—1.7 cm. long, white, with a funnel-shaped yellow tube: petals narrow-cuneate, longitudinally concave, slightly truncate at the apex, 4—4.5 mm. broad, red-margined beneath. *Fila-*

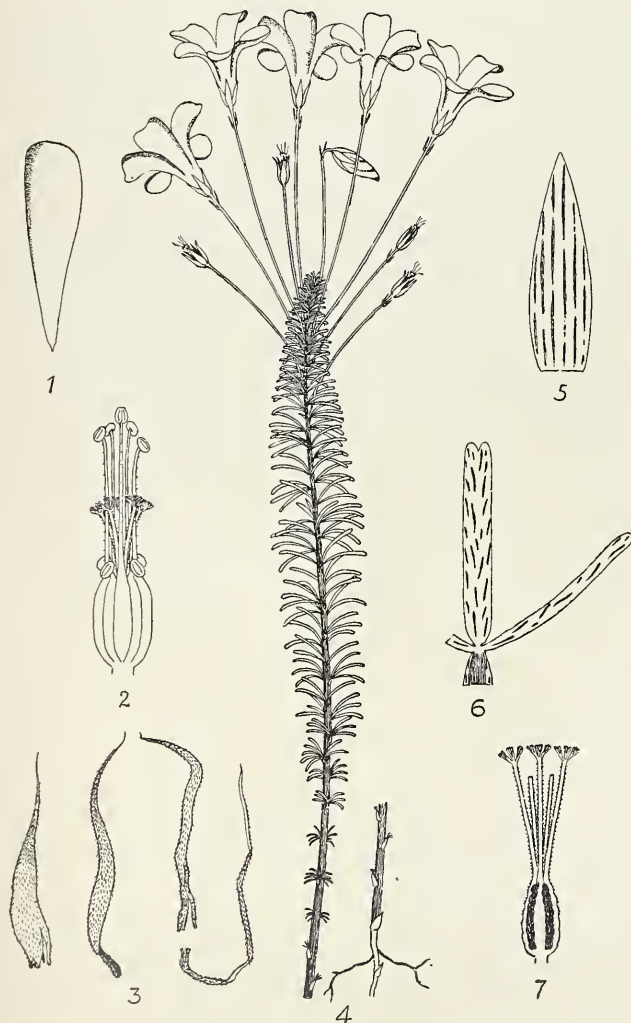


FIG. 44. *Oralis heidelbergensis* Salter. 1. Petal  $\times 2$ . 2. Androecium  $\times 6$ . 3. Bulb tunics, natural size. 4. Plant, natural size. 5. Sepal (dried)  $\times 8$ . 6. Leaf (dried)  $\times 4$ . 7. Gynaecium  $\times 6$ . (Salter 2385.)

ments, the shorter 1.5—3 mm., the longer 3—6 mm. long, minutely and sparsely glandular-pilose, edentate. *Ovary* up to 2 mm. long, callose to the base between the angles, glandular-pilose on the upper half, the chambers 4—6-ovuled: styles glandular-pilose. *Capsule* oblong, about 8 mm. long. Seeds without endosperm. (Fig. 44.)

SWELLENDAM DIV.: 3 miles west of Heidelberg, S. 2385 (type in Bol. Herb.). Fl. June.

127. *O. pardalis* Sond., Flor. Cap. 1 (1860) 345. Dwarf, caulescent, 4—7 cm. high, entirely glabrous. *Bulb* lanceolate in outline, about 3 cm. long: tunics more or less lanceolate, attenuate, sharply pointed, blackish-brown, often sparsely clothed with retrorse hairs. *Rhizome* glabrous, with a few small scales. *Stem* 2—4 cm. long, foliate on the upper part, with a few scales below. *Leaves* loosely imbricate, patent or more or less ascending, with very short squamiform petioles: leaflets 3, sessile, linear or very narrowly linear-cuneate, conduplicate, emarginate, slightly recurved near the apex, 0.6—1.8 cm. long, copiously sprinkled with linear pellucid striae which turn black in drying. *Peduncles* up to 10, 1-fld., axillary, slender, often 2—3 cm. long, with 2 alternate linear striate bracts a little below the calyx. *Sepals* narrow-ovate, 2.5—3.5 mm. long, minutely ciliate, striate with narrow pellucid (or when dried) black lines. *Corolla* 1.4—1.7 cm. long, "whitish or rosy" (fide Sonder), or entirely yellow, with a funnel-shaped tube: laminae of the petals rotund-obovate, rather sparsely striate near the margin, a little longer than the attenuate claw. *Filaments*, the shorter 1.5—3 mm., the longer 3—5 mm. long, slightly gibbose, the longest unequal. *Ovary* pubescent on the upper half, conspicuously callose when dried, the chambers 2—3-ovuled: styles minutely pubescent, the longest glandular-pilose on the upper part. Seeds without endosperm.

WORCES. DIV.: sandy places at Hex River, *Burke*, Zey. 253 (type in Herb. Sond.), near De Doorns, S. 6042 (yellow). Fl. May-June.

There is no trace of colour in the corollas of the two sets of *Burke* & Zey. 253 seen by me and they may possibly have been yellow. My own specimens (S. 6042), with the corolla yellow, from which the description of the bulb is taken, seem to be otherwise identical. The leaves are fewer, longer and much more loosely imbricate on the stem than in *O. melanographa*, *O. camelopardalis* and *O. confertifolia*, var. *lutea*.

128. *O. grammophylla* Salter, Journ. of S.A. Bot. II (1936) 8. Caulescent, 3—10 cm. high, clothed with soft whitish hairs. *Bulbs* lanceolate in outline, congested: tunics very numerous, loose, lanceolate or ligulate, often tortuous, needle-pointed, brown, shining, more or less clothed with retrorse brown hairs, the outer often splitting and 3-partite at the base. *Rhizome* up to 8 cm. long. *Stem* with a few brown scales, sometimes

branching at the base. *Leaves* rather closely imbricate on the upper part of the stem, the lower often subsessile, the upper petiolate: petioles reddish, up to 1 cm. long: leaflets 3, very shortly petiolulate, linear or cuneate, rarely broadly cuneate or even obovate, conduplicate or involute, emarginate, 0.6—2.2 cm. long, glabrous above, villose beneath and on the margins, sprinkled with small pellucid striae which turn black in drying. *Peduncles* 1-fld., axillary, reddish, as long as or longer than the leaves, with 2 alternate linear bracts on the upper part. *Sepals* lanceolate, up to 5 mm. long, ciliate, longitudinally striate with pellucid (or when dried) black lines. *Corolla* 1.1—1.8 cm. long, yellow, with a concolorous funnel-shaped tube, frequently with an orange-red eye at the throat: petals cuneate, scarcely attenuate at the base, truncate or even retuse at the apex, 5—8 mm. broad, usually rubro-maculate on the outer margin beneath. *Filaments*, the shorter 2—3 mm., the longer 3—5.5 mm. long, minutely and sparsely glandular-pilose, slightly gibbose. *Ovary* pubescent, with a few admixed capitate hairs and numerous calli on the upper half, the chambers 2—3-ovuled: styles glandular-pilose, sometimes with simple hairs only below. *Capsule* broadly oblong. Seeds without endosperm. (Fig. 45.)

FORM A. (typical). Shortly caulescent, 3—4 cm. high. *Stem* often branching at the base. *Leaves* closely imbricate, the foliaceous part of the stem short: leaflets linear or cuneate, 0.6—1 cm. long, 1.5—3 mm. broad. *Corolla* 1.1—1.5 cm. long, sometimes with a red eye at the throat.

CALVINIA DIV.; Karamoe, *S.* 4469 (*type* in Bol. Herb.), 1650A (cult.), 5376. Fl. May.

FORM B. Plant larger, up to 10 cm. high, the foliaceous part of the stem longer. *Leaflets* linear, up to 2.2 cm. long. *Corolla* up to 2 cm. long, without a red eye.

CLANW. DIV.; near Langekraal, *S.* 2468, 5387, Doornbosch, *S.* 1651 (cult.), 5383.

FORM C. *Leaflets* linear, up to 1 cm. long. *Corolla* always with a red eye. *Stamens* (or styles) longer, the longest shortly exerted from the corolla tube.

CALVINIA DIV.; above Botterkloof, *S.* 2478, 4444, 5377.

FORM D. Foliaceous part of the stem scarcely elongated. *Leaves* subapical: leaflets small, broadly cuneate or even obovate. *Corolla* 1.5—1.8 cm. long, without a red eye.

CALVINIA DIV.: 7—14 miles east of Nieuwoudtville, *S.* 4485, 5364, 5365.

This variable species is undoubtedly very much affected by epharmonic influences. It is evidently widespread in the little explored triangle Calvinia—Doornbosch—Nieuwoudtville and more extended collecting

may make it possible to separate certain definite varieties, but at present it is not advisable to give varietal status to the four Forms defined above. In cultivation Forms A and B produced long leafy stems with distinctly



FIG. 45. *Oxalis grammophylla* Salter. 1. Sepal  $\times 8$ . 2. Androecium  $\times 8$ . 3. Bulb tunics, natural size. 4. Plant  $\times 2$ . 5. Petal  $\times 3$ . 6. Gynaecium  $\times 8$ . 7. Leaflet of form B (dried)  $\times 2$ . 8. Leaf (dried)  $\times 4$ . (Salter 4469.)

axillary peduncles, the latter assuming an elongate procumbent habit.

129. *O. Robinsonii* Salter & Exell, Journ. of Bot. LXVIII (1930)

146. Slender, erect, up to 15 cm. high, entirely glabrous or sparsely



pubescent, usually with a well exerted stem. *Bulb* lanceolate in outline or narrow-conical, often contorted: tunics lanceolate, attenuate, needle-pointed, often splitting at the base, pilose with retrorse coppery hairs. *Rhizome* often about 6 cm. long. *Stem* 1—8 cm. long, glabrous, densely foliaceous. *Leaves* more or less closely imbricate: petioles, the lower very short, squamiform, the upper terete, slender, up to 3 cm. long: leaflets 3, sessile, linear, conduplicate, emarginate, usually 1—1.8 cm. long, with elongate pellucid streaks which turn black in drying. *Peduncles* 1-fl'd., often numerous, axillary, very slender, usually 5—9 cm. long, with 2 rather large pellucid-streaked alternate bracts near the calyx. *Sepals* lanceolate, 4—6 mm. long, usually minutely ciliate, longitudinally striate with pellucid (or when dried) black lines. *Corolla* 1.1—1.8 cm. long, yellow or white, with a funnel-shaped yellow tube: petals cuneate, scarcely attenuate to the base, sometimes subtruncate, involutely channelled, pellucid-streaked on the outer margin. *Filaments*, the shorter 2—3.5 mm., the longer 3—5.5 mm. long, minutely glandular-pilose, edentate. *Ovary* 2 mm. long, glandular-pilose on the upper half, conspicuously callose when dried, the chambers about 7-ovuled: styles minutely glandular-pilose. *Capsule* somewhat longer than the sepals. Seeds without endosperm.

FORM A. (*White*) M. BAY DIV.; Reutersbosch, *S.* 376/57 (*type* in Herb. Brit. Mus.), 2348, 3273, also 2353, 2363, *Compton* 5247: RIVERSDALE DIV.; *S.* 2376. Fl. May—June.

FORM B. (*Yellow*) M. BAY DIV.; *S.* 2357, 3278, *Compton* 5249.

Very variable in the length of the foliaceous stem and petioles. Some plants with the leaves even'y distributed on the stem resemble *O. confertifolia* var. *petiolata* in habit, while others have the appearance of species in the Sub-sect. Lineares, with the leaves clustered at the apex of an almost bare stem, but the leaves are nearly a'ways at least loosely imbricate and the long slender peduncles distinctly axillary.

#### SUB-SECT. (ii) SESSILIFOLIATAE.

Caululent. Stem leafy, the leaves all, or at least the lower subsessile or with squamiform petioles, or more rarely fascicled on abortive branchlets (e.g., *O. tenuifolia* Jacq.), the upper sometimes petiolate. Leaflets 3, linear, narrow-cuneate, oblong or cuneate-obovate. *Exceptions*: *O. hirta* L. α Form B, obovate; *O. porphyriosiphon* Salter and *O. multicaulis* E. & Z. cuneate-obcordate. Peduncles usually axillary, more rarely terminal.

Peduncles all axillary in the cauline leaves	..	..	..	..	<i>Sp.</i> 130—134
Some of the peduncles terminal	..	..	..	..	<i>Sp.</i> 135—144

Not an entirely natural sub-section, though many of the species are closely related one to another. Several of the species previously placed in Sect. *Sessilifoliae* D.C. have been transferred to Sub-sect. (i) *Pardales*, while others, which seem to be more fittingly included here, have been brought in from other Sections. *Sp.* 142—144 are perhaps intermediate with Sub-sect. (v) *Glandulosae*.

(See Group 14 in *Analysis of the Species*.)

130. *O. hirta* L. *Sp. Pl.* (1753) 434. (*A group-species. The following is a comprehensive description of the group. Synonymy is given under the differen' Forms and varieties.*) Erect, caulescent, pubescent or sub-hirsute, 5—30 cm. high. *Bulb* ovoid or subglobose, 2—3 cm. long, with soft papery brown or light brown outer tunics. *Stem* slender or robust, often branching, foliaceous on the upper part, often glabrous and bearing a few scales towards the base. *Leaves* cauline, imbricate or often congested, patent, with short squamiform petioles 1—5 mm. long or rarely longer: leaflets 3, sessile, linear, linear-cuneate, oblong or obovate, the wider sometimes slightly emarginate, often conduplicate-falcate, usually between 0.5 and 1.5 cm. long, glabrous above, pilose beneath, ecallose. *Peduncles* 1-fl'd., axillary, often 3—7 cm. long, with 2 alternate bracts a little below the calyx. *Sepals* more or less lanceolate, 4—8 mm. long, pubescent, ciliate, ecallose. *Corolla* polymorphous, 1.4—4 cm. long purplish, violaceous, white or more rarely yellow or copper-coloured, the pubescent yellow tube varying from funnel-shaped, shorter than or equalling the laminae of the petals, to cylindrical, up to 3 times as long as the laminae: laminae more or less broadly obovate, often obscurely acute at the apex, pubescent and often buff-coloured or purple-streaked along the outer margin beneath. *Filaments* minutely glandular-pilose, the longer edentate or rarely gibbose, the longest, in forms with the narrow corolla tube, usually well exerted. *Ovary* ovoid, usually pubescent above, with conspicuous elongate orange or red calli, the chambers 1- or rarely 2-ovuled: styles pubescent below, glandular-pilose above. *Capsule* short, globose. Seeds without endosperm.

α Typical.

✓ FORM A.—*O. hirtella* Jacq. and *O. hirta*, 47, tab. <sup>13</sup>~~53~~ in Jacq. *Oxal.* *Stem* often simple. *Leaflets* linear, linear-cuneate or oblong. *Corolla* violaceous, rarely white, the tube funnel-shaped, shorter than or as long as the laminae.

CAPE PENIN.; *MacO.* 201, 202, 1715 (ex pte.), 2622, *Bolus* 4014, 7186, *W. Dod* 1065, 1190, *B.H.* 14519, 14521, 14545, *Marl.* 5605, 5673, 7728, 12743, *Pillans* 2499, *S.* 244/13, 571 (ex pte.), 574, 1299, 3302, 3306, 8064, 8074 (white, almost glabrous), 8096: CAPE DIV.; *B.H.* 22235, *S.* 562: STELLENBOSCH DIV.; *E. & Z.* 673 (*O. tubiflora*), 678

(*O. multiflora*) : MALMESB. DIV. ; B.H. 14568, S.A.M. 48360, S. 655A, 783, 8639 : WELLINGTON DIV. ; B.H. 20066 : SWELLENDAM DIV. ; Smith 4188 : CLANW. DIV. ; Edwards 220. Fl. Apl.—June.

Occasionally produces double flowers.

FORM B.—*O. brevicaulis* Sond. Stem simple or branched. Leaflets obovate, emarginate. Corolla whitish or pale violet : tube short, yellow.

TULBAGH DIV. ; Drège, Zwartland (*O. brevicaulis* Sond., *O. reptatrix* E. Mey., non Jacq.), Schltr. 7926 : MALMESB. DIV. ; S. 8630 : CAPE PENIN. ; MacO. 1715 (ex pte.), W-Dod 1177, Phillips 9495, Schltr. 7829, S. 571 (ex pte.), Smith 2873. <sup>9475</sup>

Note.—The sets Salter 571 and MacOwan 1715 show the merging of this into the typical Form A.

FORM C.—*O. multiflora* Jacq. Stem usually much branched. Leaflets variable. Corolla whitish, cream-coloured or pale violet ; tube short.

MALMESB. DIV. ; S. 777, 782, 790, 2412, 3353.

FORM D.—*O. Bachmannii* R. Knuth—*O. acutiuscula* R. Knuth. Stem often branched. Leaflets cuneate-obovate or oblong, obtuse or acute, the squamiform petioles longer than in the typical form. Corolla rose or violaceous.

MALMESB. DIV. ; Klipheuveld, Bachmann 1816 (*O. Bachmannii* R. Knuth), Cloete (B.H. 14537) S. 791, 2408, 3357, 4512, 4514, 8633 : Loc. unknown, Ludwig (*O. acutiuscula* R. Knuth), E. & Z. 675 (*O. secunda*).

A rather indefinite form which seems to merge into Forms A and E.

FORM E.—*O. rubella* Jacq.—*O. fulgida* Lindl.—*O. hirta* L, vars. *rubella* and *fulgida* R. Knuth. Stem often more branched than in the typical form. Leaflets rather narrow. Corolla full rosy-purple or copper-coloured : tube short.

CAPE PENIN. : E. & Z. 679 (*O. rubella*), Bolus 3386, B.H. 14546, S. 541, 3300, 3304, 8097 : CAPE DIV. ; Zey. 208, S. 524, 559, 3341 : MALMESB. DIV. ; S. 2163, 2267, 6587.

FORM F. Intermediate between *O. rubella* Jacq. and *O. hirta* L, var. *intermedia* Salter. Corolla purple, rather large, the tube long and narrowly funnel-shaped.

MALMESB. DIV. ; F. Bolus (B.H. 14567), Pillans 6649, S. 652, 2236, 2258, 4510 : STELLENBOSCH DIV. ; S. 5272 : TULBAGH DIV. ; S. 4535 : WORCES. DIV. ; S. 5262 : WELLINGTON DIV. ; S. 6018.

Var.  $\beta$  *canescens* R. Knuth.—*O. rosacea* Jacq. Plant cano-hirsute or cano-pubescent. Stem simple or branched. Corolla bright rosy-purple, the tube very short and laminae broad. Ovary chambers 1—2-ovuled.

CAPE PENIN. ; Lion's Mt., E. & Z. 676 (*O. hirta*), S. 506, 6573, 8089 : MALMESB. DIV. ; B.H. 22607. Schltr. 7793 from Sir Lowry Pass is doubtful.

✓~~✗~~ Var.  $\gamma$  **tenuicaulis** R. Knuth.—*O. crassipes* L. Bolus.—*O. fortipes* R. Knuth. Much more slender and often taller than the typical form. *Leaflets* linear or linear-cuneate. *Corolla* white or yellow, the tube shorter than the laminae.

FORM A. *Corolla* white. MALMESB. DIV.; Hopefield district (the type is not specified by the author, but the following are cited: *Bachmann* 1442, 1793, 1805, 1855, with which my specimens were compared by Dr. Knuth), *S.* 4517, 8635, *B.H.* 22611, Groot Post, *E. & Z.* 677 (*O. hirtella*), *S.* 5994, 5995, 5996, *Leipoldt* (B.H. 18701—*O. crassipes* L. Bolus).

FORM B. *Corolla* yellow. MALMESB. DIV.; Vredenberg district, *S.* 4521, 4526.

The thickening of the peduncle above the bracts, in fruit, which characterises *O. crassipes*, is a seasonal growth common to several species.

✓ Var.  $\delta$  **intermedia** Salter, var. nov. *Caulis* plerumque simplex. *Foliola* linearia. *Corolla* magna, 2.8—3.5 cm. longa, tubo laminis  $1\frac{1}{4}$ — $1\frac{1}{2}$ -plo longiore, in dimidio inferiore cylindrico, superne anguste infundibuliforme. *Filamenta* longissima exserta.

TULBAGH DIV.; near Gouda, *S.* 2275 (type in Bolus Herb.), 2167, *Schltr.* 7845: WELLINGTON DIV.; *S.* 4496: PIQBG. DIV.; *Edwards* 60: MALMESB. DIV.; *Leipoldt* (S.A.M. 48364), *S.* 2264, 2435, 5281, 8627.

*Stem* usually simple. *Leaflets* linear. *Corolla* large, 2.8—3.5 cm. long, purple: tube  $1\frac{1}{4}$ — $1\frac{1}{2}$  times as long as the laminae, cylindrical in the lower half, narrowly funnel-shaped above.

✓ Var.  $\epsilon$  **polioeides** Salter, var. nom. nov.—*O. canescens* Jacq.—*O. tubiflora* Jacq., var. *canescens* Sond. Erect. *Stem* simple or branched. *Leaflets* narrow-obovate to linear-cuneate. *Peduncles* short, usually 0.5—1 cm. long. *Corolla* small, violaceous, purple or rarely white, the tube subcylindrical, as long as or a little longer than the abruptly spreading laminae.

V.R.'s. DORP DIV.; *S.* 984, 1372, 5305, 7256: CLANW. DIV.; *Zey.* 205, *E. & Z.* 674 (*O. canescens*), *Drège*, *Bolus* 9399, *Leipoldt* 465, 704, 710, *B.H.* 20460, 21479, *Pillans* 6638, *S.* 681, 5656 (cult., with the habit of var.  $\eta$  *secunda*, but with a shorter corolla tube): PIQBG. DIV.; *S.* 2421, 2439A, 5621, 8157 (all with the corolla tube very narrowly funnel-shaped): MALMESB. DIV.; Vredenberg, *S.* 4528, 5428, *B.H.* 22606 (*corolla* purple, habit of var.  $\zeta$ , Form B.)

✓ Var.  $\zeta$  **tubiflora** (Jacq.) Salter, var. nov.—*O. tubiflora* Jacq. and vars. *robusta* Sond. and *minor* Sond.—*O. macrostylis* Jacq.

FORM A. Erect, rigid. *Stem* simple or branching, 1—30 cm. long. *Peduncles* 0.5—2 cm. long. *Leaflets* linear or rarely obovate. *Corolla*



rosy-purple, the tube 2—3 times as long as the abruptly spreading laminae. Longest stamens (or styles) 2—2.5 cm. long.

V.R.'s. DORP Div.; *Schltr.* 8301: CLANW. Div.; *Bolus* 9397, 9398, *Mader*, *Leipoldt* 144, 436, 709, *Pillans* 6674, 6676, *S.* 375/18A, 675, 731, 5433, 8125, 7251, *Edwards* 222: PIQBG. Div.; at or near Grey's Pass, *Schltr.* 7929, *Pillans* 6684, *S.* 375/18B, 745, 1683, 4426, 4486, 5293, 8150.

FORM B. Very slender, with a narrower corolla tube. (Perhaps an epharmonic form.)

CLANW. Div.; *Leipoldt* 431, *B.H.* 19668, *S.* 6690.

\* Var.  $\eta$  **secunda** (Jacq.) Salter, var. nov.—*O. secunda* Jacq.—*O. tubiflora* Jacq., var. *secunda* Sond. Stem procumbent, the branches and peduncles erect. Corolla reddish-purple, the tube long, cylindrical.

Probably the foregoing variety altered by cultivation in Europe and only included here on the evidence of Jacquin's description and figure (tab. 12). *S.* 5656 (cult.), see var.  $\epsilon$ , has exactly this habit, but has a much shorter corolla tube.

*Zey.* 205, placed here by Sonder, is var.  $\epsilon$  *polioeides* Salter.

A polymorphous group-species, common in the S.-W. district, in which, on account of a series of intermediate forms, it seems advisable to include the species *O. tubiflora* and its varieties.

With some exceptions, notably the plants included under var.  $\delta$  *polioeides intermedia*, there is a curious and as yet unexplained tendency for the tube of the corolla to become gradually longer as the species extends to the northward, the typical forms of *O. hirta*, with a short funnel-shaped tube, in the Cape Peninsula and its environs gradually merging by degrees into those with long cylindrical corolla tubes (*O. tubiflora*), which are predominant from Piquetberg to Clanwilliam.

All the forms figured by Jacquin, except *O. secunda* (undoubtedly an epharmonic variant due to cultivation) may be recognised in the field, but it has been found, as is often the case with the commoner species, that there is a bewildering number of geographical micro-variants. Although many of them can be roughly attributed to one or other of the existing varieties, taking the group as a whole, it becomes almost impossible to continue the attempt to separate every variant taxonomically.

Certain characters, e.g. the shape of the leaflets, density of the indument, colour of the corolla, the proportionate length of the tube to the laminae of the corolla and the degree of exsertion of the longest stamens or styles, appear at first sight to be of value in the separation of varieties, but in practice definite combinations of such characters cannot always be found. Nevertheless, in the foregoing classification



of the specimens I have, for convenience, attempted to divide them into broad varieties, some of which have been further separated into Forms which show some salient character. It must be acknowledged that such classification is arbitrary, particularly in the case of some of the older dried specimens and the plants placed in these groups are by no means always identical.

It is not possible, in my opinion, to uphold the species *O. brevicaulis*, *O. Bachmannii* or *O. acutiuscula* either as separate species or even varieties, the characters by which they have hitherto been classified being too indefinite. *O. brevicaulis*, only distinguished by the shape of the leaflets, varies a great deal in habit, plants drawn up by surrounding vegetation being taller and more robust than many forms of *O. hirta*. On the Lion's Head (Cape Peninsula) it has been found to merge gradually into the form *O. hirtella* Jacq.

The Form  $\alpha$  E (*O. rubella* Jacq.) seems in many cases to be only distinguishable by the colour of the corolla and also gradually merges through Form  $\alpha$  F, into var. *intermedia*, which is, in turn, intermediate with var. *tubiflora*.

Var.  $\beta$  *canescens* is easily recognisable in the field from Jacquin's excellent illustration (*O. canescens* Jacq. tab. 17), though in dried specimens its identity is not so apparent.

The only form found with a yellow corolla is evidently only a colour variant of the white var. *tenuicaulis* R. Knuth, a variety which may possibly merge into  $\alpha$  Form C.

Var.  $\delta$  *intermedia* is intermediate between *O. hirta* L. and *O. tubiflora* Jacq., but nearest to the latter. This variety with  $\alpha$  Form F and var.  $\epsilon$  *polioides* with a comparatively short corolla tube (in itself a mixture of a number of differing forms), show the advisability of amalgamating *O. hirta* and *O. tubiflora*.

Although some of the forms of var.  $\zeta$  *tubiflora* are large strong branching plants, up to 30 cm. or more high (*O. tubiflora* var. *robusta* Sond.), I can find no valid reason for separating var. *minor* Sond., which is to a great extent an epharmonic form. The slender Form B., however, may be a constant sub-varietal variant.

✕ 131. *O. pseudo-hirta* Salter, sp. nov. Caulescens, gracilis, crasse pubescens. *Bulbus* ovoideus, tunicis subrigidis atro-brunneis. *Folia* caulina, inferiora subsessilia, suprema breviter petiolata: foliola 3, lineari-cuneata. *Pedunculi* uniflori, axillares. *Sepala* lanceolata. *Petalorum* laminae pallide roseo-violaceae, concolores, unguiculis luteis aequantes. *Ovarium* callosum, loculis 3-ovulatis. (*O. macrae* affinis).

Erect, caulescent, 6—16 cm. high, rather densely and coarsely pubescent. *Bulb* ovoid, acute, about 2 cm. long: tunics subrigid, darkish

brown, minutely foveolate. *Stem* 4—11 cm. long, with a few scales or abortive leaves below, rather densely leafy on the upper part, sometimes branching. *Leaves* imbricating: lower petioles squamiform often 2 mm. long, those towards the apex of the stem articulated, the basal part squamiform, terete above the articulation, up to 4.5 mm. long: leaflets 3, linear or linear-cuneate, conduplicate, slightly falcate, obtuse, emarginate, 4—7 mm. long, glabrous above, pubescent beneath, introrsely ciliate, minutely brown-dotted when dry. *Peduncles* several 1-fl., axillary, 2—4 cm. long, with 2 alternate linear adpressed bracts towards the calyx. *Sepals* lanceolate, 4—5 mm. long, darkening towards the apex. *Corolla* 1.2—1.9 cm. long, pale rosy-violaceous, with a bright yellow funnel-shaped sparsely pubescent tube: laminae of the petals obovate, 5—9 mm. broad, about as long as the tapering claw. *Filaments* sparsely glandular-pilose, the longer 3.5—8 mm. long, edentate. *Ovary* cano-pubescent on the upper half, callose, the chambers usually 2—3 ovuled: styles pubescent below, with pluricellular capitate hairs above.

WORCES. DIV.; near Stettyn, 21 miles south of Worcester, *S.* 2310 (*type* in Bol. Herb.): ROBERTSON DIV.; Langeberg, *Galpin* 9937. Fl. May—June.

Resembling *O. hirta* L., but smaller and more slender, with shortly petiolate upper leaves. It is somewhat intermediate between that species and *O. macra* Schltr., but differs from both in the bulb tunics and in the 2—3-ovuled ovary chambers.

✕ 132. *O. subsessilis* L. Bolus in Journ. of Bot. LXVI (1928) 10. Caulescent, the long branching stem (at least in cultivation) procumbent. *Bulb* ovoid, about 2 cm. long, with thin reddish-brown tunics. *Stem* branched, leafy, pubescent near the base and on the upper part, glabrescent in the middle, brown, polished, often 25 cm. or in shade up to 40 cm. long, 1.5—2 mm. in diam., the branches up to 15 cm. long. *Leaves* sessile with squamiform or flattened pubescent petioles 1 mm. long or less: leaflets 3, linear-cuneate, obtuse, entire or rarely slightly emarginate, often conduplicate, 0.7—1.4 cm. long, 2—3 mm. broad, glabrous above, pubescent or at length glabrous beneath, minutely and inconspicuously callus-dotted towards the apex. *Peduncles* 1-fl., in the upper leaf axils, 1.5—3.5 cm. long, pubescent, with 2 alternate bracts, 2—3 mm. long, near the middle. *Sepals* linear-lanceolate, acute or subobtuse, 5—6 mm. long. *Corolla* up to 2 cm. long, pale lilac, with a narrowly funnel-shaped dull yellow tube, the petals narrowly cuneate-obovate, rotund or somewhat acute at the apex, about twice as long as the narrow attenuate claw, purple-streaked and dotted along the outer margin beneath. *Filaments* edentate, the longer very minutely glandular-pilose. *Ovary* glabrous or sparsely glandular at the apex, copiously callose on the upper half, the chambers 1—

2-ovuled: styles, the longest 9.5 mm. long, pubescent near the base, slightly exerted from the corolla tube. (*The long-styled flower only has been observed*).

MALMESB. Div.; Saldanha Bay, *Lonstein*, Nat. Bot. Gar. Kirst. 905/35 (cult.); ? loc. *Leipoldt* (B.H. 18702, *type* in Bol. Herb.).

The locality given for the *type*, viz. Worcester Div., is almost certainly erroneous. I have only seen this species in cultivation.

\* 133. *O. crocea* Salter, Journ. of S.A. Bot. II (1936) 12. Erect, caulescent, often branching, sometimes bushy, 5—10 cm. high, densely clothed with hyaline pluricellular hairs. *Bulb* large, narrow-ovoid or oblong, acute at the apex: tunics rather loose, rough, undulate, splitting, blackish-brown. *Rhizome* up to 20 cm. long, usually coated with old bulb tunics, at least on the lower part. *Stem* up to 9 cm. long, leafless at the extreme base, densely leafy above, with 1—8 branches up to 3 cm. long. *Leaves* numerous, congested, with scale-like petioles 0.5—1.5 mm. long: leaflets 3, sessile, cuneate-clavate, 6—10 mm. long, 2—4 mm. broad, conduplicate, slightly falcate, deeply incised with ovate lobules at the apex, subglaucous, glabrous above, pilose beneath and on the margins. *Peduncles* 1—5, 1-fl., axillary, with 2 subulate bracts a little below the calyx. *Sepals* broadly lanceolate, 5—6.5 mm. long, often subobtusate, ciliate. *Corolla* 1.8—2.2 cm. long, bright yellow, with a broadly funnel-shaped concolorous tube: petals broadly cuneate, subtriangular, abruptly and obliquely truncate at the apex, 0.9—1.1 cm. broad, sometimes purple-streaked on the outer margin beneath. *Filaments*, the shorter 3—4.5 mm., the longer 4.5—8 mm. long, sparsely glandular-pilose on the outer edge, shortly and obtusely toothed. *Ovary* about 2.3 mm. long, glabrous, ecallose, the chambers 3-ovuled: styles glandular-pilose. *Capsule* subglobose. Seeds without endosperm. (Fig. 46.)

NAMAQUALAND; 10 miles north-west of Steinkopf, on coarse gravelly slopes, *S. 5550* (*type* in Bol. Herb.). Fl. June.

\* 134. *O. Meisneri* Sond., Fl. Cap. I (1860) 345.—*O. cuneifolia* Meisn. in Pl. Krauss., non Jacq.—*O. cana* Sond. Erect, caulescent, up to 16 cm. high. *Bulb* ovoid or globose-ovoid, 1.5—3 cm. long, with rather hard, dark brown tunics. *Rhizome* often 6—8 cm. long, the scales completely or almost amplexicaul. *Stem* 2—12 cm. long, sometimes branching, near the base, hirsute with simple hairs alone or with longer capitate hairs admixed. *Leaves* subsessile on the upper half of the stem, with very short scale-like petioles: leaflets 3, sessile, conduplicate or involute, sometimes slightly falcate, 0.5—1.2 cm. long, entire at the subobtusate apex, pubescent or silky on both sides, rarely with a few capitate hairs beneath. *Peduncles* 1-fl., often fairly numerous, arising from the axils

of the leaves or stem scales, 3—9 cm. long, the lower longer than the upper, like the sepals pubescent, with or without longer capitate hairs admixed, with 2 alternate filiform bracts near the calyx. *Sepals* lanceolate

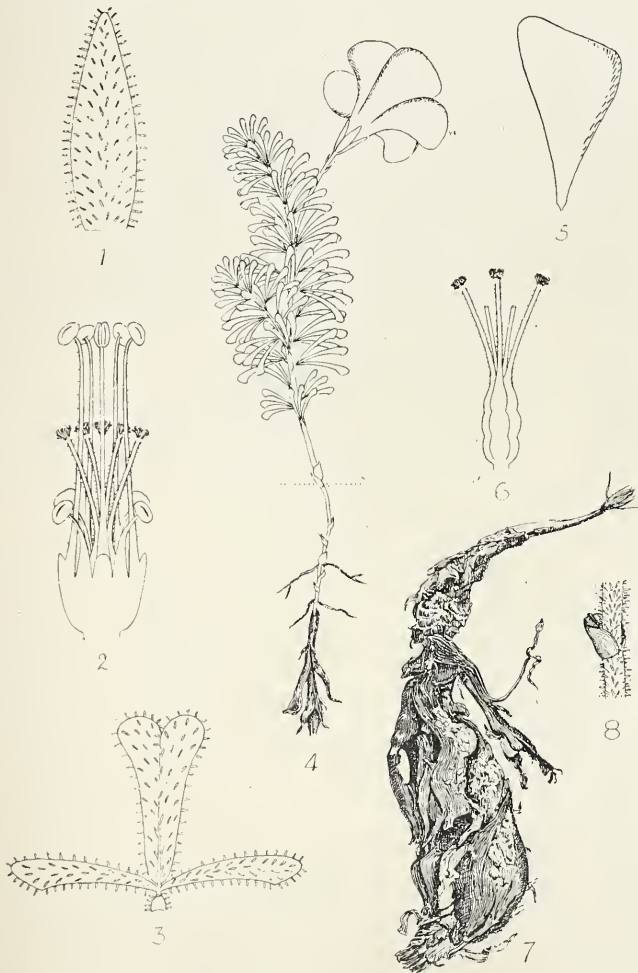


FIG. 46. *Oxalis crocea* Salter. 1. Sepal  $\times 6$ . 2. Androecium  $\times 6$ . 3. Leaf, under side  $\times 3$ . 4. Plant, natural size. 5. Petal  $\times 1\frac{1}{2}$ . 6. Gynoecium  $\times 6$ . 7. Bulb, natural size. 8. Portion of stem, with bract  $\times 4$ . (Salter 5550.)



or linear-lanceolate, sometimes attenuate, 7—9 mm. long, ecallose. *Corolla* 1.6—2.5 cm. long, yellow or pale violet, with a funnel-shaped pubescent tube: petals 0.6—1.1 cm. broad, the obliquely obovate laminae pubescent on the outer margin beneath, about as long as the claw. *Filaments*, the shorter 3—4.5 mm., the longer 4—6.5 mm. long, glandular-pilose on the upper part, with rather broad obtuse teeth. *Ovary* thickly pubescent on the upper half, ecallose, the chambers 2-ovuled. Seeds without endosperm. (Fig. 47.)

FORM A. *Corolla* pale violet. Hairs both simple and capitate.

TULBAGH; *Krauss* 1156 (type in Herb. Sond.).

FORM B. *Corolla* pale violet. Hairs all simple.

TULBAGH; *S.* 4536, 5266, *Leipoldt* (B.H. 19731). Fl. Apl.—June. Usually growing in partial shade.

FORM C. *Corolla* yellow. Hairs both simple and capitate.

WORCES. DIV.; Hex River ?\* *Burke & Zey.* (pars in S.A. Mus., *O. cana* Sond.): TULBAGH; *S.* 2096A, 2171A, 4541, *Leipoldt* (B.H. 19732). Fl. Apl.—June.

FORM D. *Corolla* yellow. Hairs all simple.

Hex River ?\* *Burke & Zey.* (pars in Herb. Sond., *O. cana* Sond.): TULBAGH; *S.* 2096B, 2171B, 6082, 6087, *Bolus* 15111.

Forms C and D have been found growing in association. I believe the locality Hex River, given by Burke & Zey., to be open to the gravest doubt. (See note under *O. Zeyheri* Sond.)

*O. Meisneri* and *O. cana* were each founded by Sonder on single collections, but further material shows that they are the same species, only differing in the colour of the corolla and in the nature of the hairs. A more striking example of the inadvisability of creating "herbarium species" upon such limited evidence could scarcely be found. Four different Forms have been distinguished here, but they are not considered worthy of even varietal rank. The type specimen of *O. cana* in Sonder's Herbarium has simple hairs only, i.e. Form D, whereas the specimen from this set in the South African Museum is Form C. I have not succeeded in re-finding the typical Form A. (See Journ. of S.A. Bot. IX (1943) 161.)

This species is in no way related to *O. polyphylla* Jacq., var. *pubescens* Sond., as suggested by Sonder.

135. *O. viscosa* E. Mey. ex Sond., Fl. Cap. I (1860) 344. Erect, caulescent, 10—17 cm. high, rather densely clothed with viscid gland-tipped and often pluricellular hairs. *Bulb* oval or ovoid, acute at the apex, up to 1.7 cm. long, with rather thin, brown tunics. *Rhizome* usually short. *Stem* 5—15 cm. long, rather densely leafy, with 1—2

\*See Introduction, Part III. Errors in Zeyher's localities.



scales towards the base, rarely with very short branchlets. *Leaves* cauline, alternate, rather numerous, the lower petioles very short, squamiform, the upper terete, up to 3 mm. long : leaflets 3, subsessile, linear-

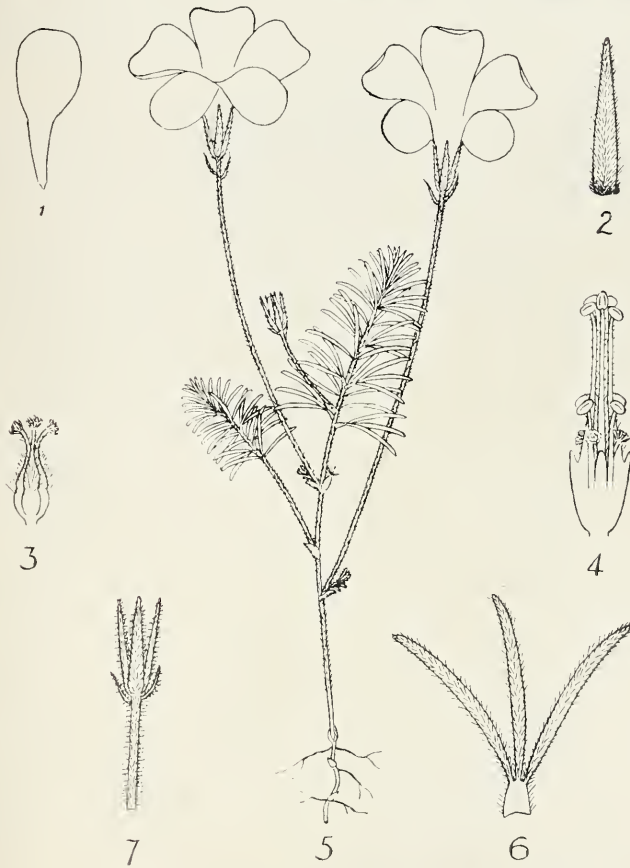


FIG. 47. *Ocalis Meisneri* Sond. (Form with simple hairs only.) 1. Petal, natural size. 2. Sepal  $\times 3$ . 3. Gynaecium  $\times 5$ . 4. Androecium  $\times 5$ . 5. Plant, natural size. 6. Leaf  $\times 3$ . 7. Calyx and upper part of the peduncle of the glandular form. (Salter 4536.)

cuneate, often conduplicate, acute, emarginate, 0.6–1 cm. long, 2–2.5 mm. broad, rather thin, glabrous above, pilose beneath, ciliate. *Peduncles* 1-fl., slender, in the axils of the upper leaves, 2–6 cm. long, with 2

minute alternate bracts above the middle. *Sepals* lanceolate, 3—4.5 mm. long. *Corolla* 1.3—1.8 cm. long, glandular-viscid, white, with a widely funnel-shaped yellow tube: petals obliquely cuneate, subtruncate, slightly attenuate at the base. *Filaments* glandular-pilose, the longer 3.5—5.5 mm. long, with short obtuse teeth. *Ovary* glandular on the upper half, the chambers 1-ovuled: styles densely glandular-pilose. Seeds without endosperm.

TULBAGH Div.; Postelynberg, *Drège*; PIQBG. Div.; Pietersfontein, *Drège* (*type*), about Grey's Pass, *Schltr.* 7932, *B.H.* 14593, 19779, *S.* 383/11, 668, 743, 2442, 5405, *Pillans* 6677: CLANWM. Div.; Doorn Bridge, *S.* 680, *Pillans* 6669: V. R's Dorp Div.; Heerenlogement, *Zey.* 210, *S.* 7261, *Andreae* 467. Fl. May—July.

136. *O. porphyriosiphon* Salter, Journ. of S.A. Bot. II (1936) 14. Erect, caulescent, viscous, 5—11 cm. high, often tufted, clothed with pluricellular capitate hairs and short simple crispate hairs admixed. *Bulbs* ovoid or narrow-ovoid, acute at the apex, often congested and deformed, 1.5—2 cm. long: tunics blackish brown, somewhat gummy. *Rhizome* short, often 1—2 cm. long. *Stem* about 7 cm. long, with a few scales below, but almost entirely leafy. *Leaves*, the lower subsessile, the upper with petioles up to 3 mm. long: leaflets 3, sessile, cuneate-obcordate, conduplicate, usually falcate, 2.5—4 mm. long, 1—2 mm. broad, glabrous above, sparsely pubescent beneath, with longer capitate hairs on the midrib and margins. *Peduncles* 1-fld., axillary, often 2—3 cm. long, ebracteate or with 1 or very rarely 2 minute bracts on the upper half. *Sepals* ovate-lanceolate, up to 3 mm. long, reddish, sometimes darkening at the apex, ecallose. *Corolla* 2—2.3 cm. long, viscous, particularly on the tube, reddish-purple, the tube *dark purple*, narrowly funnel-shaped, with a dull yellow eye at the throat: laminae of the petals obovate, subtruncate or slightly retuse at the apex, 7—9.5 mm. broad, ciliate with capitate hairs, as long as the narrow claw. *Filaments*, the shorter 4—6 mm., the longer 6—8.5 mm. long, sparsely glandular-pilose, narrowly toothed, the longest very unequal. *Ovary* globose-ovoid, 1 mm. long, pubescent above, ecallose, the chambers 1-ovuled: styles pubescent below, sparsely glandular-pilose above. Seeds without endosperm. (Fig. 48.)

CLANW. Div.; in damp places, Pakhuis Pass, about 2,800 ft., *S.* 2454 (*type* in Bol. Herb.), 5399. Fl. May—July.

Easily distinguished by the dark purple tube of the corolla.

✱ 137. *O. Leipoldtii* Schlechter, Journ. of Bot. XXXVI (1898) 24. *The following is Schlechter's description*:—"Slender, about a span high. *Stem* erect or flexuous, simple, more or less terete, glandular-puberulous, leafy. *Leaves* all sessile: leaflets 3, more or less equal in length, linear

or cuneate-oblong, glandular-puberulous, glabrous above, 0.3—0.5 mm. long. *Peduncles* axillary, erecto-patent, filiform, glandular-puberulous, when in flower 1.5—2 cm. long, lengthening after flowering up to 4.5 cm.

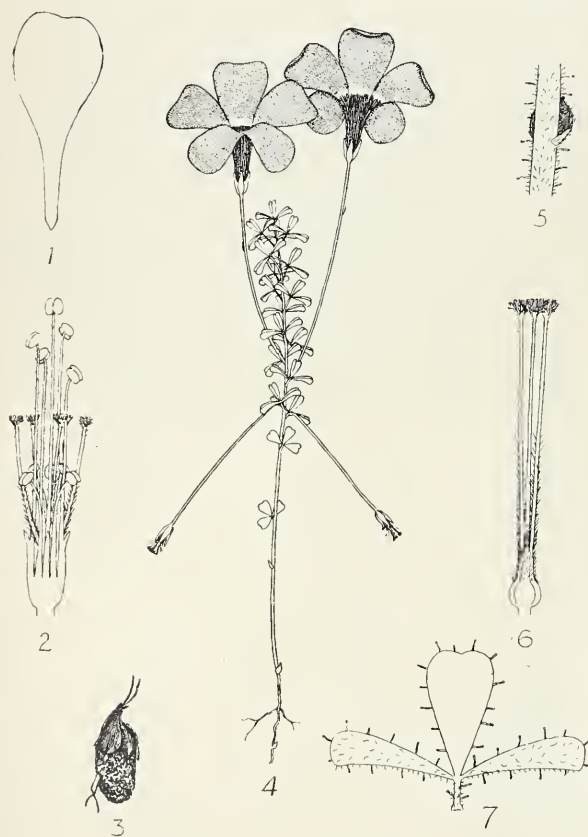


FIG. 48. *Oralis porphyriosiphon* Salter. 1. Petal  $\times 1\frac{1}{2}$ . 2. Androecium  $\times 6$ . 3. Bulb, natural size. 4. Plant, natural size. 5. Part of stem  $\times 8$ . 6. Gynoecium  $\times 6$ . 7. Leaf, showing upper surface of medial leaflet  $\times 6$ . (Salter 2454.)

long. *Bracteoles* none. *Sepals* linear-lanceolate, acute, 2—3 mm. long, densely glandular-puberulous. *Corolla* 'deeply' (*alte*) funnel-shaped, 1.5—1.6 cm. long: tube slightly swollen towards the apex, like that of

*O. purpurata*, completely glabrous; petals rotundate, narrowed towards the base, glabrous. *Styles* hispid at the base, completely glabrous above the middle. *Ovary* strigose: capsule rotundate, scarcely longer than the calyx. *Seed* oblong.

CLANW. DIV.; In hills near Clanwilliam, about 400 ft. June 1897, *Leipoldt*.

This species should be placed next to *O. viscosa* E. Mey., from which it is separated by its slenderer pedicels, the want of bracteolae and the longer and more cylindrical corolla tube with a purplish limb. I have not seen tubers, but judging from a few scales adhering to the roots, they most resemble those of *O. glabra* Jacq. The stems appear to grow in tufts like those of *O. multicaulis* E. & Z."

The type of this species cannot be traced and I cannot associate the description with any plant known to me. There is a local tradition that the species intended was that which he labelled *O. microphylla* Schltr. sp. nov., since described as *O. microphylla* Schltr. ex R. Knuth, an invalid name, and now included under the species *O. giftbergensis*. This *O. microphylla*, however, was not collected until shortly after the publication of *O. Leipoldtii* and does not by any means agree with his description. Failing the discovery of the *type*, this species must remain 'species ignota'.

The comparison of the corolla as described with that of *O. purpurata* is impossible to understand.

✕ 138. *O. giftbergensis* Salter, *Journ. of S.A. Bot.* IV (1938) 112.—*O. microphylla* Schltr. ex. R. Knuth, non H.B.K. Erect, slender, caulescent, often caespitose, 6—20 cm. high, clothed with both short simple and longer pluricellular capitate hairs. *Bulb* more or less ovoid or oblong, 2—3 cm. long: tunics hard, black, gummy, not separable. *Rhizomes* 5—10 cm. long, with a few scales. *Stem* leafy on the upper part only. *Leaves* cauline, either all subsessile with scale-like petioles, or the upper sometimes with filiform petioles up to 1.2 cm. long: leaflets 3, sessile, cuneate or linear-cuneate, falcate-conduplicate, emarginate, 3.5—9 mm. long, glabrous above, pubescent beneath, glandular-pilose on the medial nerve and margins, ecallose. *Peduncles* 1-fl'd., in the axils of the middle leaves, 2—7 cm. long, slender, with 2 alternate bracts on the upper half. *Sepals* lanceolate or linear-lanceolate, sometimes slightly attenuate, 2.5—4.5 mm. long, often darkening at the apex, ecallose. *Corolla* 1.5—2.5 cm. long, glandular-pilose, pink, violaceous or white, the tube sub-cylindrical, yellowish, with 5 narrow longitudinal lines on the upper part: laminae of the petals obliquely obovate, shorter than the very narrow claw. *Filaments* glabrous, the shorter 4.5—7 mm., the longer 8—11 mm. long, dentate. *Ovary* pubescent on the upper half, ecallose, the chambers

1-ovuled: styles pubescent below, sparsely glandular-pilose above.  
Seeds without endosperm. (Fig. 49.)

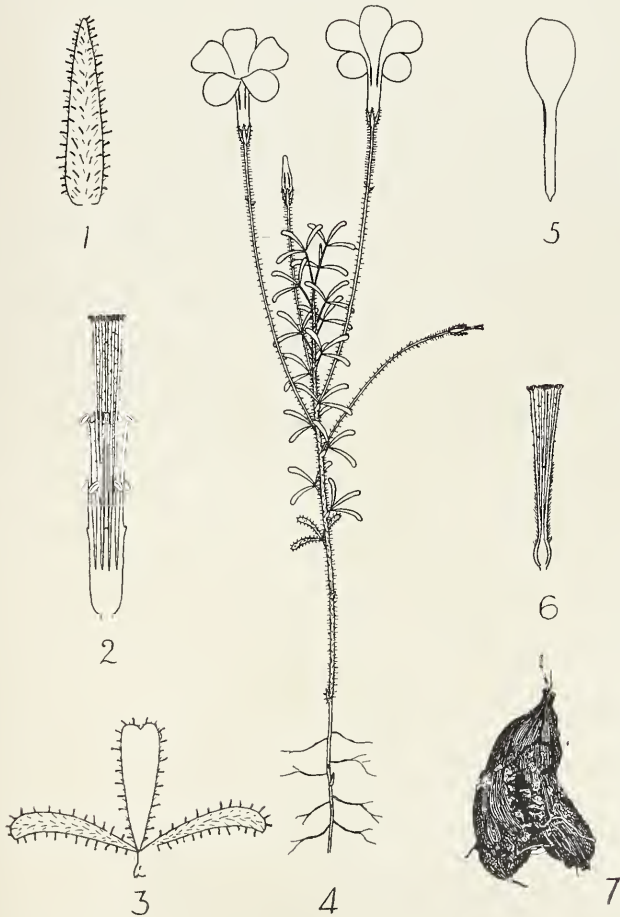


FIG. 49. *Ocalis giftbergensis*, Salter. 1. Sepal  $\times 8$ . 2. Androecium  $\times 4$ . 3. Leaf  $\times 4$ . 4. Plant, natural size. 5. Petal  $\times 1\frac{1}{2}$ . 6. Gynaecium  $\times 4$ . 7. Bulb, natural size. (Salter 7263.)

V. R's DORP DIV.; Gift Berg, on western slopes and summit, *S.* 7263  
(type in Bol. Herb.) 7294: CLANW. DIV.; *Leipoldt* (*O. microphylla* Schltr.



ex. R. Knuth, Berlin and S.A. Mus.), *Leipoldt* 434, 707, Graafwater area, a more robust form, *B.H.* 20461, *S.* 7252, Pakhuis Pass, *B.H.* 19700, 19701, *S.* 2133 (white), 8128, 8143, Wupperthal, *Leipoldt* 708. Fl. May—June.

The name *O. microphylla* R. Knuth (1927) is invalid, being antedated by *O. microphylla* H.B.K. (1821). The species is somewhat variable and intermediate forms collected in Pakhuis Pass, after the original description of *O. giftbergensis* was published, show that the two species are inseparable and the latter name is therefore adopted.

This species has been confused with *O. Leipoldtii*, q.v.

\* 139. *O. macra* Schltr., Eng. Bot. Jahrb. XXVII (1900) 155. Slender, caulescous, albo-puberulous, 8—14 cm. high. *Bulb* ovoid, acute at the apex, 2—3 cm. long, with soft papyraceous brown tunics. *Rhizome* slender, up to 10 cm. long. *Stem* sometimes branched, up to 13 cm. long, with conspicuous scales below, foliaceous on the upper part. *Leaves* cauline: petioles short, those of the lower leaves often squamiform, the uppermost longest, filiform, up to 1 cm. long: leaflets 3, linear, conduplicate, subobtusate, 0.4—1 cm. long, glabrous above, pubescent beneath, obscurely dotted. *Peduncles* 1-fl., axillary, mostly 1—3 cm. long, with 2 alternate subulate bracts near the calyx. *Sepals* lanceolate or linear-lanceolate, sometimes attenuate, 4.5—5 mm. long, ecallose. *Corolla* 1.5—2 cm. long, pubescent, white or pale pink, with a broadish funnel-shaped yellow tube: laminae of the petals obovate, often more or less bordered with greyish-purple on the outer margin beneath. *Filaments*, the shorter 2.5—4 mm., the longer 4—7.5 mm. long, sparsely pluricellular-pilose, edentate, the longest very unequal. *Ovary* 1 mm. long, pubescent and furnished with 5 conspicuous reddish calli on the upper half, the chambers 1-ovuled: styles pubescent below, sparsely pluricellular-pilose above. *Capsule* sub-globose. Seeds without endosperm.

PIQBG. Div.; Grey's Pass (Piquenier's Kloof) *Schltr.* 7928 (*type*), about 5 miles south of Grey's Pass, *S.* 3324, 5431. Fl. June.

The locality given for the *type* is probably not exact and I believe it to have been collected in the same locality as my own specimens cited above. (See Footnote on page 124). Though included in the sub-series Lineares in Pflrch-Ox., its real affinity is with *O. hirta* L.

\* 139A. *O. macra* Schltr. × *O. Creaseyi* Salter. Hybrid. Two rather similar presumed hybrids (Forms A and B) between these species have appeared in the National Botanic Gardens at Kirstenbosch where the two parents are growing intermingled and both seeding freely. (See Introduction, Part VIII, Hybridisation).

Both of these have formed dense caespitose tufts, having increased very rapidly from bulbils, a characteristic habit of both parents, at

any rate in cultivation. The two differ slightly one from the other and though both resemble *O. macra* more than *O. Creaseyi*, Form A is shorter in stature and is nearer to the latter species than Form B. Apart from the fact that the occurrence of these plants cannot be accounted for in any other way, their intermediate characters and the fact that the pollen is defective, point almost certainly to their being of hybrid origin. Perhaps the most striking clue is to be found in the leaflets, which are not emarginate as in *O. macra*, but are entire at the apex and show slight, but unmistakeable signs of the apical penicillation of those of *O. Creaseyi*, a character which is, as far as is known, unique in the S. African species. Neither hybrid has, however, inherited the remarkable system of bulbil production of *O. Creaseyi*.

The corolla, androecium and styles are decidedly nearest to those of *O. Creaseyi*, but the sepals are more like those of *O. macra* and the ovary chambers are 1-ovuled as in the latter species.

Both plants were of the longistylar form and produced very few seeds, rarely more than one in each capsule, but by which parent they were pollinated is, of course, not known. On germination it was found that the leaflets of the first foliage leaf also showed slight traces of the apical penicillation of *O. Creaseyi*.

This case of spontaneous hybridisation between two widely different species is of particular interest, for although it has occurred in cultivation, it is, as far as is known, the first ever recorded.

140. *O. tenuifolia* Jacq. Oxal. (1794) 74, t. 38.—*O. Thunbergiana* E. & Z.—*O. Loddigesiana* E. & Z.—*O. patula* E. & Z. Slender, caulescent, more or less pubescent, 6—24 cm. high, often caespitose. *Bulb* from ovoid to globular, attenuate, often 2—3 cm. long, with hard blackish-brown tunics. *Rhizome* 1—10 cm. long. *Stem* up to 20 cm. long, pubescent, leafless towards the base, with numerous abortive or rarely short leafy branchlets above. *Leaves*, the cauline subsessile and tufted, appearing fasciculate, the upper often clustered at the apex of the stem or rarely verticillate: apical petioles very short, squamiform, or terete rarely 1 cm. long: leaflets 3, sessile, linear or narrowly linear-cuneate, conduplicate or involute, emarginate, 4—9 mm. long, glabrous above, pubescent beneath, copiously callus-dotted at the apex and on the margins or more rarely ecallose. *Peduncles* 1-fld., rather numerous, axillary or terminal on the same or different plants, pubescent, 1—6 cm. long, with 2 small alternate callus-tipped bracts on the upper part. *Sepals* lanceolate or linear-lanceolate, 4—8 mm. long, pubescent, ciliate, sometimes purple-margined, often inconspicuously bicallose at the apex. *Corolla* 1.1—2.5 cm. long, thinly pubescent, white with a funnel-shaped yellow tube: laminae of the petals obovate, slightly longer than the narrow claw,

usually conspicuously purple-edged on the outer margin beneath. *Filaments*, the shorter 1.5—3 mm., the longer 3—5 mm. long, minutely glandular-pilose, unequal, with rather acute teeth. *Ovary* minutely pilose on the upper half, ecallose, the chambers 1—2-ovuled: styles usually pubescent below, glandular-pilose above. Seeds without endosperm.

PAARL DIV.; *S.* 4506, 4629, 6005, 6597, 6620: WELLINGTON DIV.; *Tyson* 849, *S.* 1772, 4637, 6014: MALMESB. DIV.; *E. & Z.* 685 (*O. Loddigesiana* E. & Z.), *S.A.M.* 48366, *S.* 1034, 1748, 2263, 2656, 3376, 6017: CAPE DIV.; *S.* 3367, 4628, 8750: CAPE PENIN.; *Bolus* 4025, *Schltr.* 820, *W-Dod* 1102, *B.H.* 15015, *S.* 243/15, 1300, 5677, 8219: STELLENBOSCH DIV.; *E. & Z.* 684 (*O. patula* E. & Z.), *S.* 608, 5274, 6140: CALEDON DIV.; *E. & Z.* 683 (*O. Thunbergiana* E. & Z.), *Schltr.* 7762, *Guthrie* 2229. Fl. May—Aug.

A rather common species in the Cape and neighbouring Divisions and one showing the greatest variation. In some plants all the leaves are subsessile in pseudo-fasciculate clusters right to the apex of the stem and all the peduncles axillary. In others, there is a distinct cluster of petiolate leaves and flowers in addition to the subsessile leaves below, these plants being with or without axillary peduncles. As both forms often occur in the same colony, it has been found impossible to separate them as varieties. Although without glandular hairs, it seems to be an affinity of the following species.

141. *O. multicaulis* E. & Z., Enum. I (1836) 87, n. 681.—*O. polyadenia* Schltr. Erect, caulescent, often caespitose, 5—10 cm. high, more or less clothed with both short simple and longer gland-tipped hairs. *Bulb* ovoid, attenuate at both base and apex, 1—2 cm. long, with hard rigid smooth blackish tunics. *Rhizome* short, slender. *Stem* 5—20 cm. long, rarely branching freely, usually with a few scales on the lower part, leafy above, sometimes with very short abortive leafy branchlets, pilose with simple and gland-tipped hairs, rarely glabrous. *Leaves* both cauline with squamiform petioles 1—2 mm. long, and terminally congested with terete petioles 0.5—2 cm. long: leaflets 3, cuneate-obovate, cuneate or linear-cuneate, emarginate, often conduplicate, 3—9 mm. long, glabrous above, silky-pubescent and copiously dotted with large calli beneath, ciliate with gland-tipped hairs on the medial nerve and margins. *Peduncles* 1-fl., apical, very rarely cauline, mostly 0.5—2 cm. long, like the sepals pilose with simple and gland-tipped hairs, with 2 alternate linear callose bracts close to the calyx. *Sepals* lanceolate, oblong-lanceolate or oblong, acute or subobtusate, 3—4 mm. long, red-margined, with 2—6 conspicuous elongate apical calli usually extending down to the middle. *Corolla* 1.4—2 cm. long, glandular, white or pink, with a funnel-shaped yellow tube: laminae of the petals obovate,

as long as the claw, with a broad reddish-purple outer margin beneath, sometimes with a few orange calli near the apex. *Filaments*, the shorter 1.5—3.5 mm. long, the longer 2.5—6 mm. long, minutely glandular-pilose, with rather acute teeth. *Ovary* more or less glandular, the chambers 1-ovuled: styles glandular-pilose, sometimes with simple hairs admixed. Seeds without endosperm.

CALEDON DIV.; Kleinriviersbergen, *E. & Z.* 681 (*type* in Herb. Sond.) *Zey.* 2131, *Purcell* (S.A.M. 45926), *B.H.* 22332, *S.* 6208, 6210, 6211, Hermanus *S.* 1183, 6189, Villiersdorp, *S.* 1144 (very sparsely glandular): BREDASDORP DIV.; *Schltr.* 7626: STELLENBOSCH DIV.; *Parker* 3687: CAPE PENIN.; Devil's Peak, *E. & Z.* 682 (*O. tenuifolia*), *Bolus* 3392, *W-Dod* 1100, 1140, *B.H.* 15016, *Pillans* 2472, *S.* 243/17, 646: CAPE DIV.; *S.* 3342, 3372, 4632, 8165: MALMESB. DIV.; *S.* 1036, 2273: PAARL DIV.; *S.A.M.* 48371, *S.* 1336, 4659, 4660: TULBAGH DIV.; *Schltr.* 9014 (*O. polyadenia* Schltr.): WORCES. DIV.; *Rogers* 16513: Loc. ?, *Schltr.* 1168, *Burchell* 8567. Fl. May—Aug.

✂ Var.  $\beta$  *stolonifera* Salter, var. nov. *Bulbus* 1—1.4 cm. longus, inferne haud attenuatus. *Rhizoma* stolonibus lateralibus subterraneis bulbiferis instructum. *Caulis* 4—6 cm. longus. *Foliola* anguste lineari-cuneata. *Pedunculi* brevissimi. *Filamenta* longiora brevissime dentata.

PAARL DIV.; 3 miles west of Wellington, *S.* 3444 (*type* in Bol. Herb.) 4636. Fl. July.

*Bulb* 1—1.4 cm. long, not attenuate below. *Rhizome* producing long lateral underground stolons. *Stem* 4—6 cm. long. *Leaflets* narrowly linear-cuneate. *Peduncles* very short. *Sepals* and *corolla* as in the typical form. Teeth on filaments very short.

*O. polyadenia* Schltr. seems to be only one of the many forms.

Var.  $\beta$  is difficult to place as it approaches *O. Urbaniana* Schltr. in the form of the bulb. It is, however, almost identical with *O. multicaulis* in its vegetative and floral characters.

142. *O. Urbaniana* Schltr. Eng. Bot. Jahrb. XXVII (1900) 157. Erect, caulescent, 7—15 cm. high. *Bulb* ovoid, acute at the apex, 1—1.5 cm. long, with several obtuse vertical ridges: tunics brown, the outer papyraceous, the inner rigid. *Rhizome* short, sometimes producing lateral stolons from near the apex. *Stem* 3—12 cm. long, more or less foliaceous, usually naked towards the base and often with very short branchlets above, rather sparsely pubescent with simple hairs, usually with gland-tipped hairs admixed. *Leaves*, the cauline very shortly petiolate, the upper sometimes subterminally congested with petioles 5—7 mm. long: leaflets 3, linear-cuneate, conduplicate, emarginate, 5—8 mm. long, glabrous above, more or less sparsely pubescent beneath, often ciliate with gland-tipped hairs on the margin



and medial nerve, bicallose or ecallose at the apex, often on the same plant. *Peduncles* 1-flid., axillary or sometimes sub-terminal, 1.5—2.5 cm. long, like the sepals pubescent, with gland-tipped hairs admixed: bracts 2, small, alternate, subulate, close to the calyx. *Sepals* lanceolate or linear-lanceolate, 4—6 mm. long, usually inconspicuously bicallose at the apex. *Corolla* 1.5—2.2 cm. long, rosy-pink or white, with a funnel-shaped yellow tube: laminae of the petals broadly obovate, obliquely subtruncate, sometimes with a purplish outer margin beneath, rather longer than the narrow claw. *Filaments*, the shorter 1.5—4 mm., the longer 3—5.5 mm. long, glandular-pilose, with longish, rather acute teeth. *Ovary* pilose near the apex, the chambers 2—3-ovuled: styles pubescent below, with longish gland-tipped hairs above.

TULBAGH DIV.; Saron, *Schltr.* 7859 (*type*, Berlin), *S.* 2614, 4492: PAARL DIV.; *S.* 2674, 2675: MALMESB. DIV.; *S.* 3541, which resembles and has some of the characters of *O. recticaulis* Sond. Fl. July—Aug.

✕ Var.  $\beta$  *Leipoldtii* Salter, var. nov. Altior, gracilior, ad 24 cm. alta. *Caulis* saepe ramosus. *Petioles* ad 2 cm. longi. *Foliola* cuneato-oblonga vel anguste cuneato-obcordata, apice incisa, interdum callis 2 inconspicuis apicalibus. *Pedunculi* 2—6 cm. longi. *Corolla* roseo-rubra, tubo luteo.

CERES DIV. ? : *Leipoldt* (B.H. 20171).

A taller and more slender plant, up to 24 cm. high, the stem often branching. *Petioles* up to 2 cm. long. *Leaflets* cuneate-oblong or narrowly cuneate-obcordate, incised at the apex, sometimes with 2 inconspicuous apical calli. *Peduncles* 2—6 cm. long. *Corolla* rose-red, with a yellow tube.

This variable species has, like *O. callimarginata* Weintroub, been separated from the group-species *O. recticaulis* Sond. on the evidence of its peculiar vertically ridged bulb and rather more slender habit. *S.* 3541, although it has the bulb of *O. Urbaniana*, has the appearance and some of the characters of *O. recticaulis*.

Var.  $\beta$ , with a similar ridged bulb, closely resembles some of the elongate forms of *O. glabra* Th., but unlike that species is clothed with gland-tipped hairs.

Knuth, in Plfreh-Ox., seems to be describing some other plant, certainly not that described by Schlechter. (*See note under O. droseroides E. Mey. ex Sond.*)

✕ 143. *O. callimarginata* Weintroub, Journ. of Bot. LXIX (1931) 209. Erect, caulescent, 13—17 cm. high. *Bulb* oval, up to 1.4 cm. long, somewhat attenuate at the base and apex, with several rather acute, vertical ridges: tunics dark brown, with sharp apical points. *Stem* glabrous, rather sparsely leafy, with 1—3 semi-amplexicaul scales on the lower part, sometimes branching from the leaf or scale-axils. *Leaves*



terminally clustered, with petioles up to 1.5 cm. long or more, often cauline with shorter squamiform petioles: leaflets 3, sessile, cuneate-oblong or cuneate-obovate, incised at the apex, glabrous or very sparsely and minutely pilose beneath, with a conspicuous row of calli near the margins. *Peduncles* 1-fl., apical, 2.5—4.5 cm. long, like the petioles, very sparsely pubescent with a few gland-tipped hairs admixed: bracts 2, alternate, lanceolate, callose, a little below the calyx. *Sepals* lanceolate, acute, about 6 mm. long, glabrous, often reddish-purple at the margins, rather inconspicuously bicallose at the apex. *Corolla* 2—2.5 cm. long, white or palest lilac, with a rather broad funnel-shaped yellow tube: laminae of the petals cuneate-obovate, subtruncate, twice as long as the claw. *Filaments*, the shorter 2—3.5 mm., the longer 3.5—6.5 mm. long, glandular-pilose, with rather short teeth. *Ovary* pilose near the apex, the chambers 2-ovuled: styles pubescent below, glandular-pilose above.

TULBAGH DIV.; Saron, *Leipoldt* (B.H. 18619, type in Bol. Herb.), S. 2613. Fl. July.

A stouter plant than the foregoing, with the vertical ridges on the bulb more acute, also differing in its distinctly callose leaflets, proportionally shorter claw on the petals and shorter teeth on the filaments. It is much like some forms of *O. recticaulis* Sond., which, however, has a smooth bulb.

✕ 144. *O. recticaulis* Sond., Fl. Cap. I (1860) 330. (*A group-species.*)  
—*O. oligadenia* Schltr. ex R. Knuth.—*O. sororia* Schltr. ex R. Knuth.  
—*O. longipes* Weintroub.—*O. arenosa* Bolus f.—*O. glaucoides* R. Knuth.  
Erect, 7—17 cm. high, more or less clothed with both short, simple and gland-tipped hairs, caulescent or at least with an exerted stem. *Bulb* oval or ovoid, smooth, more or less attenuate at the base and apex, 1—2 cm. long: tunics brown or blackish-brown, sometimes slightly gummy. *Rhizome* rather slender, often producing lateral underground stolons on the upper part. *Stem* rather rigid, up to 14 cm. long, often branching, more or less leafy, rarely naked. *Leaves* both cauline and terminally clustered, the upper petioles up to 3 cm. long, usually longer than the cauline: leaflets 3, sessile, linear-cuneate, emarginate, or rarely narrowly cuneate-obovate, 0.5—1.7 cm. long, glabrous above, usually sparsely pubescent beneath, ciliate with gland-tipped hairs on the margins and midrib, conspicuously bicallose at the apex and sometimes with a row of irregular calli around the margins, very rarely ecallose. *Peduncles* 1-fl., terminal or axillary in the upper leaf axils, usually 2—8 cm. long, with 2 alternate subulate callose bracts near the calyx. *Sepals* lanceolate, ovate-lanceolate or oblong, acute or obtuse, 4—6 mm. long, with 2 conspicuous short apical calli, very rarely ecallose. *Corolla* 1.5—2.5

cm. long, white or very pale violet-rose, with a moderately wide sparsely glandular funnel-shaped yellow tube: laminae of the petals obovate, sometimes a deeper rose on the outer margin beneath, a little longer than the claw. *Filaments*, the shorter 2—4 mm., the longer 3—7 mm. long, with rather long, acute teeth. *Ovary* pubescent on the upper half, the chambers 3-ovuled: styles pubescent below, glandular-pilose above. Seeds without endosperm.

PIQBG. Div.; *Zey.* 209 (type in Herb. Sond.), *Schltr.* 7915 (*O. arenosa* Bolus f. and *O. glaucoides* R. Knuth), *Pillans* 7860: CLANW. Div.; *Schltr.* 7987 (*O. oligadenia* Schltr. ex R. Knuth), 10786 (*O. sororia* Schltr. ex R. Knuth), *Schltr.* 4981, *Bolus* 8951, *Van Zyl* (N. B. Gar. Kirst. 1355/30), *Leipoldt* 701B, *B.H.* 19920, 20114, *P. Sl. Mem. Ex.* 7734, *Edwards* 217 (*O. longipes* Weintraub), 223A, 228, *S.* 2730, 3383, 3645, 3658, 5616, 6108. Fl. June—Oct.

Usually found in damp places. Exceedingly variable and comprising numerous local forms, but I have been unable to find any characters sufficiently definite to justify separation into varieties. The section in which it should be placed is doubtful. Of the species included here the type (*Zey.* 209) is more densely glandular than any of the others. *O. sororia* and *O. longipes* are smaller in all parts and have fewer cauline leaves. *O. arenosa* is only distinguishable by the absence of calli on the leaflets and sepals, but this character seems to have little value in the group.

#### Sub-Sect. (iii) XANTHOTRICHAE.

Caulescent. Hairs long, uniseriately pluricellular, not capitate. Leaflets 3, oblong or linear, more rarely (in some forms of *O. adspersa* E. & Z.) obovate. Rhizome very long. (Sp. 145—147).

The name Xanthotrichae is a misnomer for the hairs are not yellow in the living state, though in some specimens only, when dried, they have a yellowish tinge and have the appearance of being 'jointed'. The five species admitted to this section by Sonder in Fl. Cap. (increased to six in Pflrch-Ox.) are inseparable and are all brought together here under *O. adspersa* E. & Z. Two later species are added. A fairly natural Sub-section.

(See Group 16 in *Analysis of the Species*. Similar hairs are found in the species with broad leaflets in Group 7).

★ 145. *O. Pillansiana* Salter & Exell, Journ. of Bot. LXVIII (1930) 145. Slender, caulescent 6—16 cm. high, clothed with long soft pluricellular hairs. *Bulb* ovoid, attenuate-acute, up to 3 mm. long: tunics pale brown, the outer splitting longitudinally into linear twisted and

crinkled fibres. *Rhizome* very long, the lower part surrounded by old fibrous tunic scales and the remains of old bulbs. *Stem* erect, up to 14 cm. long, with a few conspicuous pale brown scales, often with 1—2 very short branches. *Leaves* apically congested on the stem or branchlets: petioles slender, up to 2 cm. long, dilated at the base: leaflets 3, very shortly petiolulate, narrow-cuneate, emarginate, conduplicate, slightly falcate, 0·6—1·2 cm. long, glabrous above, thinly pilose beneath. *Peduncles* 1-fl., terminal, usually shorter than the leaves, with 2 filiform bracts near the apex. *Sepals* lanceolate, acute, 5—6 mm. long. *Corolla* 1·4—1·9 cm. long, yellow, with a widely funnel-shaped tube: petals purple-margined beneath. *Filaments* shortly glandular-pilose, the shorter 2·5—3·5 mm., the longer 4—7 mm. long, the longest recurved at the apex. *Ovary* ovoid-oblong, glandular-pilose on the upper part, callose, the chambers 1-ovuled: styles glandular-pilose.

CLANWM. DIV.; 18—20 miles north of Clanwilliam, *S.* 383/27 (type in Herb. Brit. Mus.), 679, 6123: V. R's DORP DIV.; *S.* 7254. Fl. May—June.

Very closely related to the following, but has longer stems, shorter peduncles and edentate filaments. The original description has been amplified from additional material.

\*146. *O. argillacea* Bolus f., Ann. Bol. Herb. II (1918) 23. Small, 5—9 cm. high, clothed with pluricellular hairs. *Bulb* (immature) ovoid, attenuately beaked, up to 1·5 cm. long, with dark brown tunics. *Rhizome* very long. *Stem* 1—3 cm. long, with 1—4 scales, but often scarcely exerted. *Leaves* rather numerous, apically congested: petioles 1—3 cm. long: leaflets 3, sessile, cuneate, linear-cuneate or rarely linear, deeply emarginate, conduplicate, glabrous above, 0·8—1·5 cm. long. *Peduncles* several, 1-fl., shorter than or slightly longer than the leaves with 2 filiform alternate bracts on the upper part. *Corolla* glabrous, 1·4—3 cm. long, yellow, with a rather widely funnel-shaped concolorous tube: petals cuneate, obliquely subtruncate at the apex, rarely purple-margined beneath. *Filaments* shortly glandular-pilose, the shorter 2·5—5 mm., the longer 4·5—7·5 mm. long, with rather prominent obtuse teeth, the longest slightly recurved at the apex. *Ovary* glandular-pilose on the upper half, or near the apex, the chambers, 2-ovuled: styles glandular-pilose. *Capsule* globose. Seeds without endosperm.

CLANW. DIV.; near Augsberg, 500—900 ft., *Leipoldt* 700 (type in Bol. Herb.), Karrooberg 466, *Mader* 2142: V. R's DORP DIV.; *S.* 2492 5315, 5317, 5325, 5455, 5457, 5461: CALVINIA DIV.; *S.* 4562. Fl. May—July.

The whole plant, including the corolla, is variable in size, as affected by climatic conditions. The only bulbs known are apparently well de-

veloped bulbils. The species seems to grow invariably in very hard ground and the bulb lies at such a great depth that after several attempts I have failed to obtain it in a mature state.

147. *O. adspersa* E. & Z. Enum. I (1836) 94, no. 743.—*O. affinis* Sond.—*O. florida* E. Mey. ex Sond., non Salisb.—*O. Meyeri* Sond.—*O. angusta* Sond.—*O. pilosella* R. Knuth.—*O. pallida* Salter & Exell. (*A group-species*). Caulescent, 5—15 cm. high, clothed with long soft pluricellular hairs. *Bulb* ovoid, rostrate-attenuate, up to 3 cm. long, with rather soft brown tunics. *Rhizome* very long, coated with a rough brown tunicaceous cortex. *Stem* erect, 1—8 cm. long, with 1—4 conspicuous brown scales. *Leaves* terminally congested: petioles distinctly widened below the basal articulation: leaflets 3, petiolulate, linear, linear-cuneate, oblong, elliptic-oblong, cuneate-obovate or obovate, usually emarginate, flat or conduplicate, from 0.4—3 cm. long, glabrous and sometimes glaucous above, pilose, often conspicuously veined and sometimes dotted with minute orange-brown calli beneath, ciliate. *Peduncles* 1-fl., terminal or rarely 1—2 arising from the stem scales, often 3—4 cm. long, generally exceeding the leaves, with 2 alternate or sub-opposite linear bracts on the upper part, very rarely below the middle. *Sepals* lanceolate or linear-lanceolate, cuspidate or apiculate, 5—9 mm. long, often purple-maculate, especially on the margins. *Corolla* 1.8—3 cm. long, pale lilac, red (soon fading to white when dried) or rarely white, with a funnel-shaped yellow tube: laminae of the petals broadly and very obliquely obovate, about twice as long as the claw, sometimes more or less purple on the outer margin beneath. *Filaments*, the shorter 2—4.5 mm., the longer 4—8 mm. long, glandular-pilose, with short broad obtuse teeth. *Ovary* ovoid, glabrous or glandular-pilose on the upper half, usually callose, the chambers 2-ovuled: styles shortly glandular-pilose. *Capsule* sub-globose. Seeds without endosperm.

CLANW. DIV.; Brackfontein, *E. & Z.* 743 (*type*), *E. & Z.* 742 (*O. tricolor*, *O. affinis* Sond.), *Pillans* 6662, *S.* 738, 3329, 4432, 5298, 7238, 8147, Piquenier's Kloof (Grey's Pass), *Schltr.* 7950 (*O. pilosella* R. Knuth), *B.H.* 14590, 19776, 19778, *Pillans* 6663, *S.* 383/14, 740, 1681, 2129: PIQBG. DIV.; Drège, hills near Berg River (*O. Meyeri* Sond.), *Schltr.* 7897, *Zey.* 1890, 1891, *Edwards* 61, *B.H.* 14596, *Pillans* 6680, *S.* 658, 667, 753, 2422, 2424, 2425, 2426, 2443, 3320, 3322, 3325, 3382, 5284, 5288, 5407, 5408, 8159, 383/1 (*O. pallida* Salter & Exell), 383/2: MALMESB. DIV.; Drège, Zwartland (*O. cuneifolia* E. Mey., *O. angusta* Sond.), *Bachmann* 1014, *Pillans* 6679, *S.* 657, 2271, 2417, 2435A, 4513, 8634: TULBAGH DIV.; Drège, Zwartland (*O. florida* E. Mey. ex Sond.), *S.* 2166, 2282, 2283, 5412, *Schltr.* 7843: STELLENBOSCH DIV.: *S.* 5275: CERES DIV.; ? Wolverivier, *Burke & Zey.* (probably an error in



locality): ? Div. between Kanonnenberg and Berg River, *Drège* (*O. Meyeri* Sond.  $\beta$ ). Fl. May—July.

Fairly widely distributed and varying very much in the shape and, to some extent, in the texture of the leaflets, characters upon which the several species shown in synonymy above have been principally founded.

The extreme forms are admittedly very different in appearance, but a study of the group in the field and in cultivation and the examination of a considerable number of dried specimens convinces me that it is not only impossible to place many of them definitely in one or other of the existing species and further that although constant geographical forms undoubtedly occur, there is no tangible specific difference between them. *O. adspersa* E. & Z., the oldest published name in the group, is ascribed to the form with the narrowest leaflets of all. One of the forms of *O. florida* (var. *rubra*) has a red corolla, but differs in no other respect: the colour soon fades in dried specimens and they can rarely then be distinguished.

Two forms stand out as somewhat exceptional:—

(i) *Drège* (*O. ciliaris* a E. Mey., non Jacq., *O. Meyeri* Sond.) and *S.* 2425, 5284 from near Berg River are very robust, the large leaflets variable in shape in the same colony and often dark purple beneath and the corolla exceptionally large, white.

(ii) *S.* 383/1 (*O. pallida* Salter & Exell), Piqbg. Div., with bracts below the middle of the peduncle.

Neither of the above, however, are worthy of varietal rank.

#### SUB-SECT. (iv) LINEARES.

Leaflets narrow, linear, oblong or cuneate. Plant caulescent except in *Sp.* 184—186. Leaflets 3, rarely 5—7. (See note under Sub-sect. *Multifoliolatae*.)

The species included here are not necessarily all closely related, but affinities are placed as far as possible in juxtaposition.

Corolla hypercrateriform with a sub-cylindrical densely pubescent tube, rather longer than the laminae of the petals. Leaflets 3 (except in <i>O. quinata</i> 5) . . . . .	<i>Sp.</i> 148—151
Corolla more or less funnel-shaped. Stem corticate, polished, brown. Leaflets 3, narrow-linear . . . . .	<i>Sp.</i> 152—153
Stem not as above, or wanting.	
Caulescent	
Stem normally simple.	
Capsule exerted beyond the calyx . . . . .	<i>Sp.</i> 154—158
Capsule not or scarcely exerted.	
Longer filaments toothed . . . . .	<i>Sp.</i> 159—173
Longer filaments not toothed . . . . .	<i>Sp.</i> 174—181
Stem branching. Leaflets 3—5, sometimes cuneate-obovate . . . . .	<i>Sp.</i> 182—183
Stem not exerted. Leaflets 3. . . . .	<i>Sp.</i> 184—186



Note.—*O. pendulifolia* and *O. duriuscula*, which are superficially similar to species in this sub-section, are placed in § Oppositae.

\* 148. *O. primuloides* R. Knuth, Eng. Bot. Jarhb. LXI, Beibl. n. 139 (1927) 5.—*O. subsericea* R. Knuth.—*O. xerophila* Salter, Journ. of S.A. Bot. IV (1938) 16. Slender, caulescent, shortly pubescent, 3—6 cm. high. *Bulb* broadly lanceolate in outline, about 4 cm. long, swollen in the lower part, with brown papery imbricating tunics. *Rhizome* often

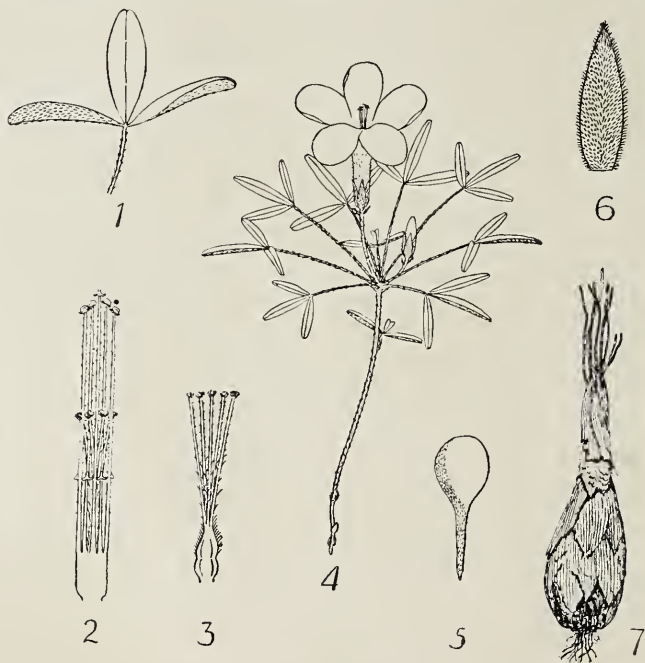


FIG. 50. *Oxalis primuloides* R. Knuth. 1. Leaf  $\times 2$ . 2. Androecium  $\times 3$ . 3. Gynaecium  $\times 3$ . 4. Plant, natural size. 5. Petal, natural size. 6. Sepal  $\times 5$ . 7. Bulb, natural size. (Salter 4455.)

12 cm. long. *Stem* slender, with a few scales or sessile leaves. *Leaves* 8—20, apically congested, sometimes 1—2 cauline: petioles filiform, up to 2 cm. long, the outer shorter or often squamiform: leaflets 3, sessile, linear-oblong or very narrowly elliptical, narrowing subcuneately to the base, minutely emarginate, more or less conduplicate, slightly falcate, glabrous above, ciliate. *Peduncles* 1—4, 1-fld., scarcely 1 cm. long, with 2 small subulate alternate bracts near the apex. *Sepals*

broadly lanceolate, often dull brick-red, darkening at the apex. *Corolla* 1.6—2.2 cm. long, lilaceous, with a pubescent cylindrical tube: laminae of the petals obovate or narrow-obovate, 4—8 mm. broad, greenish and minutely pubescent on the outer margin beneath, a little shorter than the narrow claw. *Filaments*, the shorter glabrous, the longer minutely glandular-pilose, the longest 1.5 cm. long, well exerted from the corolla tube. *Ovary* pubescent on the upper half, the chambers 2-ovuled: styles sparsely pubescent below, minutely glandular-pilose above, the longest exerted. *Capsule* globose. Seeds without endosperm. (Fig. 50.)

CALVINIA DIV.; Hantam Gebirge, *Meyer* (type, Berlin), *Meyer* (*O. subsericea* R. Knuth), one mile north of Calvinia, *S.* 4468 (*O. xerophila* Salter), 4455, Karamoe, *S.* 2481, 13 miles north of Nieuwoudtville *S.* 7337: SUTHERLAND DIV.; *S.* 3474: NAMAQUALAND; Kamieskroon, *S.* 2564. Fl. May—July.

The type specimens at Berlin of both *O. primuloides* and *O. subsericea*, which are conspecific, are so poor and starved that the species cannot be recognised from the original description. It is entirely redescribed here from more normal specimens. The figure was drawn from a plant cultivated from bulbs of *S.* 4455 and is rather more luxuriant than most of the wild specimens.

149. *O. linearis* Jacq. Oxal. (1794) 68, t. 32.—*O. arcuata* Jacq.—*O. polytricha* Sond.—*O. aretioides* Turcz.—*O. linearis* Jacq., vars. *laticor* and *minor* Sond. Erect, with an exerted stem, rather sturdy, but often dwarfed by climatic conditions, densely cano-hirsute. *Bulb* ovoid, attenuate-acute, up to 3 cm. long, with loose sharply acute dark brown tunics. *Stem* leafless, 1—14 cm. long, sometimes branching in the upper part, with several semi-amplexicaul pubescent or hirsute scales. *Leaves* usually numerous, terminally clustered, with petioles 0.5—2.5 cm. long: leaflets 3, very shortly petiolulate, linear, linear-cuneate or oblong-cuneate, often conduplicate and falcate, obtuse, usually minutely emarginate, 0.5—1.7 cm. long, 2—6 mm. broad, glabrous above, hirsute beneath, ciliate with both patent and introrse hairs, ecallose. *Peduncles* 1-flid., usually shorter than the leaves, with 2 linear bracts imbricating the calyx. *Sepals* lanceolate, 4—5.5 mm. long, densely hirsute. *Corolla* 1.6—2.2 cm. long, pale rosy violet, with a subcylindrical pubescent yellow tube: laminae of the petals obovate, rather shorter than the narrow claw, pubescent on the outer margin beneath, with a few small reddish calli near the slightly acute apex. *Filaments*, the shorter 2.5—6 mm. the longer 5.5—10.5 mm. long, minutely glandular-pilose, edentate, the longest usually well exerted from the corolla tube: anthers oblong, small. *Ovary* cano-pubescent on the upper half, often callose near the

apex, the chambers 2-ovuled : styles sparsely pubescent below, glandular-pilose above. *Capsule* globular. Seeds without endosperm.

V. R's DORP Div. ; Acht Valley, Zey., between Grootriet and Eenkoker, Zey. 241 ex pte. (var. *laticor* Sond.), Zey. 226 ex pte. (*O. polytricha* Sond.), Eenkoker, Zey. 229 (var. *minor* Sond.), S. 962, 1580, 2518, 5343, 5438, 6641. Fl. May—July.

Very prone to epharmonic variation and all Zeyher's specimens (none of which can be upheld as varieties) are much dwarfed. Under favourable conditions plants reach or even exceed the luxuriance of Jacquin's cultivated plant (tab. 32), but the procumbent stem is not a normal character in the wild state. The hairs in this species are rather harsher than is usual in this type of *Oxalis*. Drège 3207, in Sonder's herbarium, is without flowers and quite indistinguishable.

*O. arcuata* Jacq. Oxal. 67, t. 31, which is included here, is only known from Jacquin's figure, no specimen having been preserved. It may differ in that the stamens are not exerted from the corolla tube, but it has yet to be rediscovered.

*O. quinata* Savign., which follows, is probably only a 5-foliolate variety of this species.

\* 150. *O. quinata* Savign., Lam. Encycl. IV (1797) 688. Erect, caulescent, up to 14 cm. high, rather coarsely pubescent. *Stem* up to 12 cm. long, with a few scales. *Leaves* terminally clustered, with petioles up to 1 cm. long, 1—2 cauline, sub-sessile : leaflets 5, obovate-cuneate, 4—8 mm. long, conduplicate, slightly falcate, emarginate, pilose on both faces. *Peduncles* 1-fld., terminal, scarcely exceeding the leaves : bracts 2, subsetaceous, near the apex. *Sepals* lanceolate, 4 times shorter than the corolla. *Corolla* pubescent, about 2 cm. long, pale rosy violet, with a narrow yellow tube.

CALVINIA Div. ? ; Kamos, Bushmansland, Zey. (in Herb. Sond.)

I have not seen the *type* which, according to Sonder, is in Herb. Lam. and therefore follow his identification of Zeyher's specimens. It has not been collected since Zeyher's time and the exact whereabouts of Kamos is uncertain. The two specimens in Sonder's herbarium were evidently gathered in a dry season. They closely resemble *O. linearis* Jacq., except in the number of leaflets and it is probably a 5-foliolate variety of that species.

\* 151. *O. exserta* Salter, Journ. of S.A. Bot. IV (1938) 109. Erect, caulescent, densely pubescent, 4—10 cm. high. *Bulb* narrow-ovoid often 2 cm. long, with rather thin brown tunics. *Rhizome* 4—7 cm. long, with several lateral underground scale-bearing runners or stolons up to 20 cm. long, producing bulbils at their apices. *Stem* 1—7 cm. long, sometimes bearing 1—2 subsessile cauline leaves. *Leaves* fairly numerous, apically

congested, with slender petioles 0.5–1.5 cm. long: leaflets 3, linear or oblong, emarginate, subconduplicate, 0.6–1 cm. long, often glaucous,

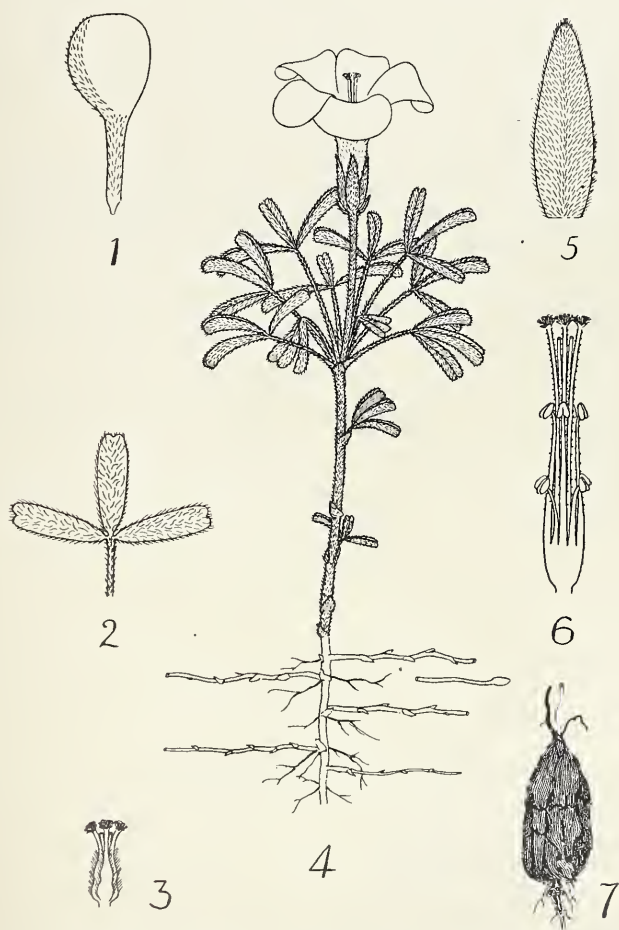


FIG. 51. *Oxalis exserta*, Salter. 1. Petal  $\times 1\frac{1}{2}$ . 2. Leaf, upper surface  $\times 2$ . 3. Gynaecium  $\times 3$ . 4. Plant  $\times 1\frac{1}{2}$ . 5. Sepal  $\times 6$ . 6. Androecium  $\times 3$ . 7. Bulb, natural size. (Salter 4589.)

ciliate, ecallose, pubescent on both faces. Peduncles few, 1-flid., as long as or little longer than the leaves, with 2 subulate bracts imbricating the

calyx. *Sepals* broadly lanceolate, subacute, 4·5—5 mm. long, ecallose. *Corolla* rose, 1·7—2·2 cm. long, with an obscurely yellow cylindrical pubescent tube: laminae of the petals obovate or narrow-obovate, as long as the narrow claw. *Filaments*, the shorter 5—8 mm., the longer 8—13 mm. long, sparsely glandular-pilose, the longest unequal, well exerted from the corolla tube. *Ovary* densely pubescent, the chambers 2-ovuled: styles glandular-pilose, the longest exerted. Sometimes produces double flowers. (Fig. 51.)

NAMAQ.; 2 miles north of Louwpoort, *S.* <sup>4587</sup>~~5489~~ (type in Bol. Herb.), near Concordia, *S.* 5536, near Kamieskroon, *L. Bolus* (B.H. 19198), *S.* 855, 867, 1547, between Kamieskroon and Springbok, *S.* 1405B, 1406B, 1469, Springbok, *S.* 901, 906; Steinkopf, *S.* 5544; mountains north east of Garies, *S.* 6675. Fl. April—June.

Flowers rather sparingly, several large colonies having been found without any trace of flowers. Bulbs from these have, after several years, only produced a few flowers in cultivation.

✓152. *O. gracilis* Jacq. Oxal.\* (1794) 69, t. 33.—*O. versicolor* L., var. *gracilis* Willd.—*O. miniata* Jacq.—*O. gracilis* Jacq., var. *miniata* Sond.—*O. teretifolia* Sond. Caulescent, erect or somewhat diffuse, the stem usually branching. *Bulb* ovoid-globose, about 3 cm. long: tunics rather loose, ovate or lanceolate, acute, dark brown with paler margins. *Rhizome* subligneous, often 10 cm. long, with amplexicaul scales. *Stem* wiry, up to 30 cm. long, with a smooth brown cortex, often branching from the scale or leaf-axils, pubescent towards the base, glabrous above. *Leaves* terminally congested on the stem, branches or branchlets, a few cauline on the upper part: petioles filiform, 1—3 cm. long, finely pubescent, widened, squamiform and ciliate below the basal articulation: leaflets 3, sessile, 1—2 cm. long, conduplicate or in dry situations involute, slightly falcate, minutely emarginate, glabrous above, minutely pubescent beneath, inconspicuously punctate with small calli towards the apex, the lateral widely divergent. *Peduncles* 1-fld., often numerous, 1—2·5 cm. long, cano-pubescent, with 2 alternate linear bracts on the upper part. *Sepals* lanceolate or linear-lanceolate, sometimes slightly attenuate, 2·5—6·5 mm. long, pubescent, darkening towards the apex. *Corolla* 1·7—2·5 cm. long, salmon-pink or white, with a funnel-shaped yellow tube: laminae of the petals more or less obovate, often sub-acute at the apex, minutely pubescent towards the outer margin beneath, about twice as long as the claw. *Filaments* the shorter 3—4·5 mm., the longer 4·5—7 mm. long, sparsely and minutely glandular-pilose, edentate. *Ovary* pubescent on the upper half, callose near the apex, the chambers 2—3-

\*For notes on this species and its confusion with *O. reclinata* Jacq., vide Journ. of S.A. Bot. VI (1940), 121—5.



ovuled: styles pubescent below, with short pluricellular capitate hairs above. Capsule slender, moniliform, up to 2 cm. long. Seeds without endosperm. (Plate VII.)

*Salmon-pink.* CLANW. DIV.; and V. R's DORP DIV.; *Zey.* 211, 212 (*O. teretifolia* Sond.), *Schltr.* 8046, *Compton* (N.B. Gar. Kirst. 942/22), *Pillans* 6660, *S.* 674, 3331, 3335, 3408, 5314, 7253, 383/7, 383/8. *White.* NAMAQ.; *Garies, S.* 2554, 5575, 5599: CLANW. DIV.; *S.* 7246. Fl. May—July.

Like var.  $\beta$  this species is remarkable for its prolific flowering. Plants sometimes produce as many as 20 open flowers at one time.

*O. miniata* Jacq. (tab. 35), with brick-red flowers, has hitherto been considered a variety of *O. gracilis*, but this slight colour variation is too trivial to accept as varietal. Nor can the white flowered form be considered separable as a variety although it does not grow in association with the typical form and has a rather different geographical distribution. *O. teretifolia* Sond. named from wretched starved specimens, in which the leaflets are shrivelled and involute, *not terete*, is also inseparable. Two well-marked varieties, however, do occur.

✓ Var.  $\beta$  *purpurea* Salter, Journ. of S.A. Bot. VI (1940) 124. Plant rather smaller. *Corolla* 1—1.6 cm. long, deep reddish purple, with a yellow tube, much smaller than in the typical form. (Plate VIII (i).)

NAMAQ.; 4—6 miles west of Garies, *S.* 3406 (*type* in Bol. Herb.), 6652, *Caporn* (B.H. 15109). Fl. June—July.

Superficially similar to *O. helicoides* Salter, but differing in having a more or less straight (not spiral) stem and an exerted capsule.

\* Var.  $\gamma$  *lilacea* Salter l.c. 125. *Stem* 5—12 cm. long, unbranched, somewhat tortuous. *Corolla* pale lilac, medium sized, but smaller than in the typical form. (Plate VIII (ii).)

V. R's DORP DIV.; 7 miles west of Nieuwerust, *S.* 5346: NAMAQ.; 10 miles south of Garies, *S.* 5501 (*type* in Bol. Herb.), 22 miles south of Garies, *S.* 6663. Fl. May—June.

✓ 153. *O. helicoides* Salter, Fl. Plants of S. Africa XV (1935) 58, Pl. 579.\* Caulescent, slender, 7—12 cm. high. *Bulb* ovoid, attenuate at the apex: tunics ovate-lanceolate to ligulate, dark brown, with reddish-brown margins. *Rhizome* 4—6 cm. long. *Stem* rigid, twisting, more or less spiral, up to 12 cm. long, with a hard polished pale brown cortex, sometimes branching, glabrous above, cano-puberulous towards the base, bearing a few puberulous scales. *Leaves* 4—9, terminally congested: petioles filiform, 1—1.8 cm. long: leaflets 3, sessile, linear, conduplicate, often slightly falcate, 0.7—1.2 cm. long, minutely emarginate, incon-

\*The original description of this species was altered and mutilated in editing: the Plate, however, is excellent.

spicuously black-dotted, glabrous above, cano-puberulous beneath. *Peduncles* 1-fld., usually terminal, 0·6—1 cm. long, adpressed cano-pubescent, with 2 small alternate bracts above the middle. *Sepals* lanceolate or ovate-lanceolate, 2—3 mm. long, cano-pubescent, ciliate, darkening towards the apex. *Corolla* 1·2—1·5 cm. long, deep ruby-magenta, with a funnel-shaped yellow tube: petals often reflexed, obovate, with a short claw, more or less obliquely truncate or sometimes acute at the apex, pubescent on the outer margin beneath. *Filaments* glabrous, the shorter 2—3·5 mm., the longer 3·5—6·5 mm. long, edentate. *Ovary* pubescent on the upper half, the chambers 1-ovuled: styles pubescent below, glandular-pilose above. *Capsule* globular. Seeds without endosperm.

NAMAQ.; Kamieskroon, *S.* 851 (*type* in Bol. Herb.), 1405A (cult.), 10 miles south of Garies, *S.* 4603, Springbok, *S.* 905. Fl. May—June.

✱ Var. *β alba* Salter. *Corolla* white, with a paler yellow tube.

NAMAQ.; Kamieskroon, *S.* 857 (*type* in Bol. Herb.).

✱ 154. *O. campicola* Salter, Journ. of S.A. Bot. 1 (1935) 131. Small, slender, caulescent 4—7 cm. high. *Bulb* ovoid or globose-ovoid, shortly attenuate, up to 1·5 cm. long, with brown papery tunics. *Rhizome* 2—4 cm. long. *Stem* erect, rigid, 1·5—4 cm. long, rarely branched, glabrous or minutely pubescent, dark green, with 1—2 small ciliate scales. *Leaves* 6—16, apically congested: petioles filiform, up to 2 cm. long, sparsely pubescent: leaflets 3, sessile, linear, conduplicate or involute, more or less falcate, minutely emarginate, about 1 cm. long, 2 mm. broad, glabrous above, sparsely pubescent beneath, sometimes inconspicuously black-dotted and with 2 red apical calli. *Peduncles* 1-fld., slender, apical or rarely arising from a cauline scale, glabrous or sparsely pubescent, with 2 alternate subulate pubescent bracts near the apex or a little below the calyx. *Sepals* lanceolate or ovate-lanceolate, 3—4·5 mm. long, sparsely pubescent, ciliate, narrowly membranaceous at the margin, dark purple on the margins near the base, orange-callose above, with 2 oblanceolate orange apical calli. *Corolla* 1·4—2 cm. long, white, with a funnel-shaped yellow tube: laminae of the petals cuneate-obovate, slightly truncate, 4—5 mm. broad, often narrowly purple-streaked on the outer margin beneath, tapering to an attenuate claw. *Filaments*, the shorter 2·5—4 mm., the longer 4·5—6 mm. long, sparsely glandular-pilose, edentate. *Ovary* oblong, cano-pubescent on the upper half, with elongate calli near the apex, the chambers 2-ovuled or 5—6-ovuled: styles often purplish, pubescent below, pluricellular-pilose above. *Capsule* globular or oblong, exserted. Seeds without endosperm. (Fig. 52.)

CALVINIA DIV.; Karamoe, *S.* 4445 (*type* in Bol. Herb.), 1650B (cult.),

2480, 5375 : V. R's DORP DIV. ; 2 miles north of V. R's Dorp, *Pillans* 6636, S. 716. Fl. May—July.

There appear to be two forms, one with 2 ovules in each ovary-chamber and one with 5—6 ovules. That with 2 ovules (S. 716) has a

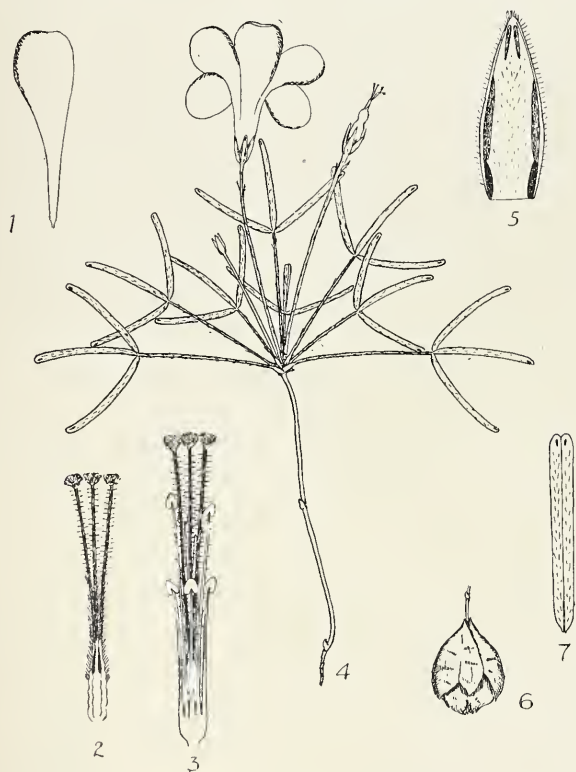


FIG. 52. *Oxalis campicola* Salter. 1. Petal  $\times 2$ . 2. Gynaecium  $\times 8$ . 3. Androecium  $\times 8$ . 4. Plant  $\times 1\frac{1}{2}$ . 5. Sepal  $\times 8$ . 6. Bulb, natural size. 7. Leaflet, under side  $\times 3$ . (Salter 4445.)

globose capsule, usually rather larger anthers and stigmas and yellowish green styles, while that with 5—6 ovules, with an elongate exserted capsule, generally has purple styles. These characters, however, are not invariably constant and I have found both forms growing together at Karamoe (S. 2480). The plants look exactly alike and I therefore hesitate

to make any varietal distinction. It is just possible that it hybridises with the next species.

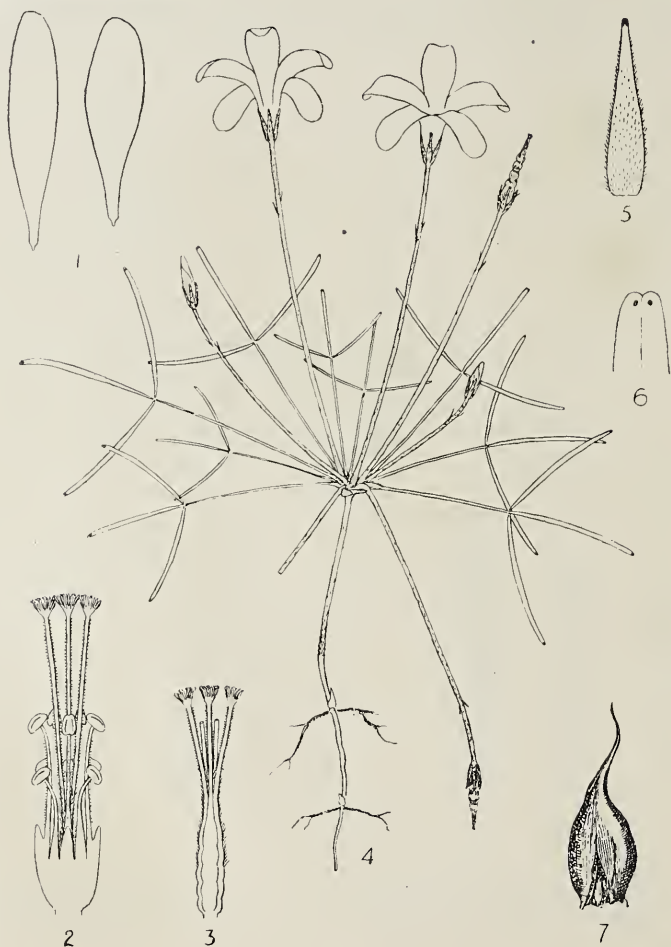


FIG. 53. *Oralis stenopetala* Salter. 1. Petals  $\times 1\frac{1}{2}$ . 2. Androecium, showing long styles  $\times 8$ . 3. Gynaecium  $\times 8$ . 4. Plant, natural size. 5. Sepal  $\times 6$ . 6. Tip of leaflet (underside)  $\times 6$ . 7. Bulb, natural size. (Salter 2469.)

★ 155. *O. stenopetala* Salter, Journ. of S.A. Bot. I (1935) 142. Slender, caulescent, 8—20 cm. high. Bulb narrow-ovoid, attenuate or often with

a tortuous acute beak at the apex, 2—3 cm. long, with hard dark brown tunics. *Rhizome* about 6 cm. long. *Stem* slender, rigid, 3—14 cm. long, dark green, minutely adpressed-pubescent, sometimes with 1—2 scales. *Leaves* 5—13, rarely more, apically congested: petioles filiform, adpressed-pubescent, usually 1—3 cm. long: leaflets 3, sessile, narrow-linear, narrowing at the base and apex, conduplicate, sometimes slightly falcate, minutely emarginate, 1—2.5 cm. long, 1—2 mm. broad, glabrous or sparsely pubescent beneath, with 2 minute apical calli, often copiously black-dotted, especially near the margins. *Peduncles* rather numerous, 1-fl., longer than the leaves, 4—6 cm. long, sparsely pubescent, with 2 small alternate bracts on the upper part. *Sepals* lanceolate, attenuate, 4—4.5 mm. long, pubescent particularly towards the base, ciliate, purplish towards the apex, with 2 red apical calli. *Corolla* 1.9—2 cm. long, white, with a yellowish funnel-shaped tube: petals oblanceolate or oblong-oblanceolate, 5—6 mm. broad, often slightly truncate at the apex, fugitive. *Filaments*, the shorter 2.5—4.5 mm., the longer 3.5—6.5 mm. long, glandular-pilose on the outer edge, with teeth about 0.3 mm. long. *Ovary* narrow, oblong, 2—2.3 mm. long, pubescent above, ecallose, the chambers 4—6-ovuled: styles pubescent at the base, glandular-pilose above. *Capsule* oblong, pubescent, about 1 cm. long, well exerted from the calyx. Seeds without endosperm. (Fig. 53.)

CLANW. DIV.; 10 miles south-west of Doornbosch, S. 2469 (type in Bol. Herb.): CALVINIA DIV.; between Doornbosch and Karamoe, S. 2475, 4448, about Nieuwoudtville, S. 1649C (cult.), 4470A, 4560, 7325, 7327. Fl. May—July.

Very variable in size and in the width of the petals. The leaflets of the specimens from Nieuwoudtville area are more copiously black-dotted. The Form  $\beta$  originally described is scarcely separable.

✱ 156. *O. xantha* Salter, Journ. of S.A. Bot. I (1935) 77. Slender, caulescent, 8—19 cm. high. *Bulb* ovoid or globose-ovoid, slightly attenuate at the apex, about 1.5 cm. long: tunics thin, pale brown, inconspicuously impresso-punctate, longitudinally nerved. *Rhizome* short. *Stem* rigid, simple or sparsely branched, 3—15 cm. long, glabrous or sparsely pubescent, green, with 1—3 brown scales or 1—2 abortive leaves. *Leaves* up to 14, apically congested: petioles 1—2 cm. long, glabrous or sparsely pubescent: leaflets 3, sessile, linear, often conduplicate or involute, slightly emarginate, up to 2 cm. long, 1—1.5 mm. broad, glabrous above, sparsely pubescent beneath, with 2 elongate apical calli, inconspicuously black-dotted. *Peduncles* 1-fl., 1.5—2 cm. long, pubescent, with 2 alternate callose bracts above the middle. *Sepals* lanceolate, 3.5—4 mm. long, sparsely pubescent, ciliate, with elongate orange calli at the margins and apex. *Corolla* 2—2.4 cm. long,



bright yellow (drying golden yellow), with a rather widely funnel-shaped concolorous tube: petals obliquely obovate, attenuate to a short claw, 0.9—1.1 cm. broad. *Filaments*, the shorter 2.5—4 mm., the longer 4—7.5 mm. long, unequal, sparsely pluricellular-pilose, edentate.

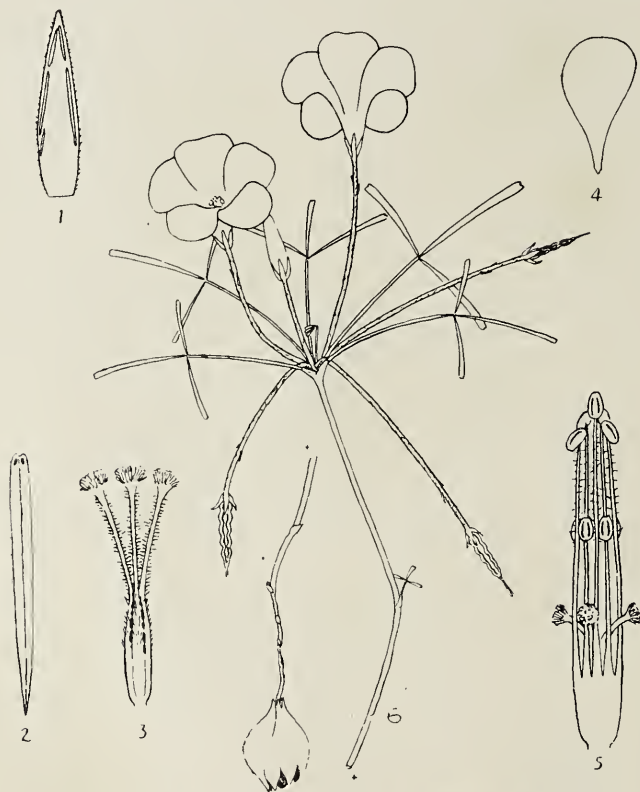


FIG. 54. *Oxalis xantha* Salter. 1. Sepal  $\times 8$ . 2. Leaflet  $\times 2$ . 3. Gynaecium  $\times 8$ . 4. Petal, natural size. 5. Androecium, showing styles  $\times 8$ . 6. Plant, natural size. (Salter 2470.)

*Ovary* slender, cano-pubescent and callose on the upper half, the chambers 5—6-ovuled: styles densely pluricellular-pilose: stigmas golden. *Capsule* moniliform, up to 1.5 cm. long, well exserted from the calyx. Seeds without endosperm. (Fig. 54.)

CLANW. DIV.; between Pakhuis and Doornbosch, about 2 miles south of Langekraal, S. 2470 (*type* in Bol. Herb.) 2472, 5386. Fl. July.

Local and only appearing in favourable seasons.

★ 157. *O. tenuipes* Salter, Journ. of S.A. Bot. IV (1938) 116. Slender, caulescent, 15—30 cm. high, sometimes tufted. *Bulbs* often congested, narrow-ovoid, acutely beaked at the apex, about 3 cm. long, with rough papery chestnut-brown tunics. *Rhizome* slender, often 4—8 cm. long. *Stem* very slender, glabrous dark green, sometimes short or in shade up to 45 cm. long. *Leaves* usually 10—14, apically congested, entirely glabrous, with filiform petioles 2—6 cm. long: leaflets 3, sessile, linear, 1·2—2 cm. long, 1—2 mm. broad, minutely emarginate, the lobules rounded, with 2 small apical calli. *Peduncles* 1-flid., slender, apical, a little longer or twice as long as the leaves, glabrous below, glandular-pilose above particularly near the apex, usually with 2 minute alternate linear rubro-callose bracts on the upper part. *Sepals* lanceolate, attenuate, 4—4·5 mm. long, sparsely glandular-pilose and ciliate, with 2 small red apical calli. *Corolla* 2—2·5 cm. long, rosy lilac, with a narrowly funnel-shaped glandular yellow tube and a distinct purple eye at the throat: laminae of the petals more or less obovate, glandular on the margin, as long as the narrow claw. *Filaments*, the shorter 4—6 mm., the longer 6—8 mm. long, sparsely glandular-pilose, slightly gibbose, the longest very unequal. *Ovary* 2 mm. long, pubescent on the upper half, ecallose, the chambers 5-ovuled: styles pubescent below, glandular-pilose above. *Capsule* oblong, exserted beyond the calyx. Seeds without endosperm. (Fig. 55.)

V. R's DORP Div.; Gift Berg, in shady places at about 2,000 ft., S. 7267 (*type* in Bol. Herb.). Fl. June.

✓ Var. *β biapiculata* Salter, l.c. 118. *Leaflets* attenuate at the apex, more deeply emarginate, the minute lobules diverging, with elongate calli at the base. *Peduncle* glabrous. *Sepals* linear-lanceolate, very narrowly attenuate, glabrous, 6—8·5 mm. long. *Petals* usually narrower.

CLANW. Div.; Warm Baths F. Bolus (B.H. 14605, *type* in Bol. Herb.), Edwards 231. Fl. June.

This variety is only known to me from dried specimens.

✓ 158. *O. phloxidiflora* Schltr., Eng. Bot. Jahrb. XXVII (1900) 155.—*O. Mallyi* Schltr. ex R. Knuth. Small, caulescent or almost stemless, 3—10 cm. high, sparsely and minutely pubescent or almost glabrous. *Bulb* ovoid or oblong-ovoid, acute, 1·5—2 cm. long, with smooth dark brown imbricating tunics. *Rhizome* slender, rather short, *Stem* up to 4 cm. long, with 1 or 2 scales, at least 1 basal. *Leaves* 6—12, terminally clustered, with very slender petioles 1—3·5 cm. long: leaflets 3, sessile, narrow-linear conduplicate, emarginate, often abruptly widened at the apex, 0·8—3 cm. long, glabrous above, sometimes sparsely pubescent beneath, with or without 2 apical calli. *Peduncles* 1-flid., stouter than the

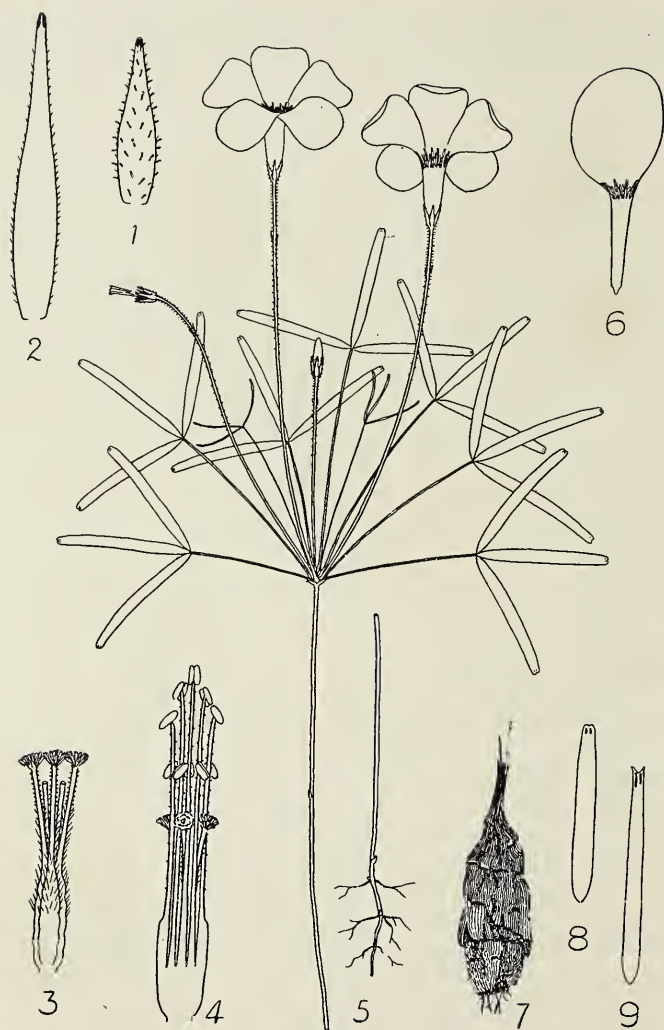


FIG. 55. *Oxalis tenuipes*, Salter. 1. Sepal  $\times 6$ . 2. Sepal of var.  $\beta$   $\times 6$ . 3. Gynoecium  $\times 6$ . 4. Androecium  $\times 6$ . 5. Plant, natural size. 6. Petal  $\times 1\frac{1}{2}$ . 7. Bulb, natural size. 8. Leaflet  $\times 1\frac{1}{2}$ . 9. Leaflet of var.  $\beta$   $\times 1\frac{1}{2}$ . (Salter 7267.)

petioles, 2—7 cm. long, with alternate linear bracts on the upper part. *Sepals* more or less lanceolate, often slightly attenuate, 3—5 mm. long, pubescent, with or without 2 reddish apical calli. *Corolla* 1.8—3 cm. long, purple, the tube cylindrical or narrowly funnel-shaped, slightly

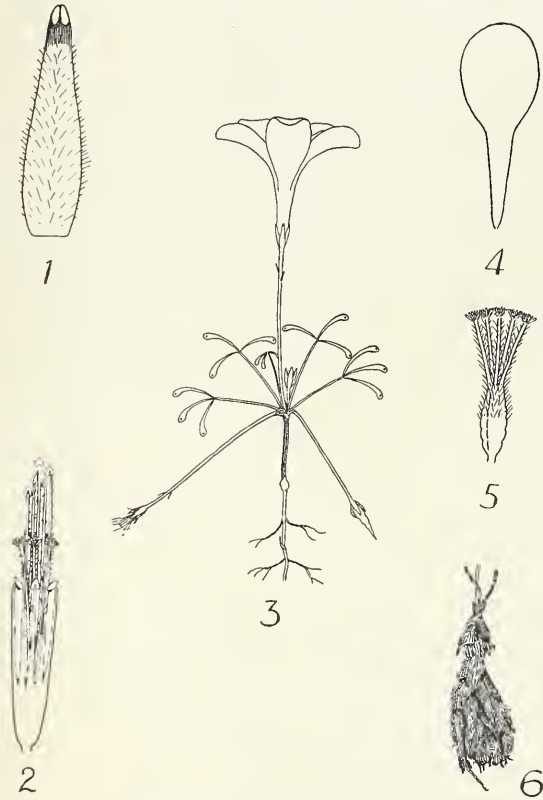


FIG. 56. *Oxalis phloxidiflora* Schltr. 1. Sepal  $\times 10$ . 2. Androecium  $\times 6$ . 3. Plant, natural size. 4. Petal  $\times 1\frac{1}{2}$ . 5. Gynoecium  $\times 6$ . 6. Bulb, natural size. (Salter 8141.)

swollen at the throat, sparsely glandular, dull yellow, sometimes with 5 narrow vertical purple lines and with a dull purple eye within the throat: laminae of the petals narrow-elliptical or narrow-obovate, about as long as the slender claw. *Filaments*, the shorter 2.5—5.5 mm., the longer 5—8 mm. long, slightly swollen near the apex, sometimes gibbose.

*Ovary* oblong, rather densely cano-pubescent, the chambers 5-ovuled: *Styles* glabrous. *Capsule* moniliform up to 1.8 cm. long, pubescent, well exserted from the calyx. Seeds without endosperm. (Fig. 56.)

CLANWM. Div.; Clanwilliam, *Schltr.* 8014 (*type*, Berlin), *Leipoldt* 701A, *B.H.* 19667, *S.* 726, Pakhuisberg, *Schltr.* 10797, (*O. Mallyi* *Schltr.* ex R. Knuth), *Mader* 2148, *S.A.M.* 26304, *S.* 2450, 2462, 2465, 5394, 8141: *Esterhuysen* 6021. Fl. May—Aug.

A species in which nearly all colonies show variations. The principal character by which it was formerly distinguished from *O. Mallyi*, namely the absence of calli on the leaflets, is not constant and is evidently not a specific difference, for there are very inconspicuous calli on a few of the leaflets in some specimens of *Schltr.* 8014, the *type* of *O. phloxidiflora*. The calli on the sepals vary in a similar way and in some of the forms the corolla tube tends to widen upwards more than in others. The slight swelling in the throat of the tube is not visible in dried specimens.

- ✕ 159. *O. involuta* Salter, *Journ. of S.A. Bot.* I (1935) 120. Small, slender, with a short stem, entirely glabrous. *Bulb* ovoid, attenuate or beaked at the apex, about 7 mm. long, irregularly angled, with brown tubercled tunics. *Stem* 0.5—2.5 cm. long, with 1—2 scales towards the base. *Leaves* 3—8, apically congested, very rarely arising from a cauline scale, with petioles 3—8 mm. long: leaflets 3, sessile, narrow-linear, incurved-ascending, distinctly involute, as though cylindrical, very rarely conduplicate, up to 1 cm. long, 0.2—0.3 mm. wide or 0.6 mm. when flattened, emarginate, with the lobules slightly divergent. *Peduncles* 1-fl., apical, much longer than the leaves, up to 5 cm. long, with 2 small alternate bracts near the calyx. *Sepals* lanceolate, slightly attenuate, 3—4 mm. long, reddish, with 2 inconspicuous elongate apical calli. *Corolla* 1.5—2 cm. long, bright yellow, with a broadly funnel-shaped concolorous tube: petals cuneate, slightly attenuate to the base, rounded at the apex, 7—9 mm. broad. *Filaments*, the shorter 2.5—4 mm., the longer 3.5—7 mm. long, glandular-pilose, shortly toothed. *Ovary* oblong, pubescent on the upper half, the chambers 3—4 ovuled: styles pubescent below, glandular-pilose above. (Fig. 57.)

PRQBQ. Div.; In wet clayey gravel, at the side of the main road 8 miles south of Porterville, *S.* 3381 (*type* in Bol. Herb.), 5409, *Leipoldt* (B.H. 19747). Fl. May—July.

Allied to the following species. It is very local and only seems to appear in favourable seasons.

160. *O. goniorrhiza* E. & Z., *Enum.* I (1836) 89, n. 699.—*O. semiglauca* E. & Z.—*O. goniorrhiza* E. & Z. var. *semiglauca* Sond. Small, caulescent, erect, slender, usually 8—12 cm. high, glabrous or sparsely and minutely pubescent, rarely glandular-pilose. *Bulb* more or less obliquely



ovoid, attenuate at the base, often rostrate at the apex, 1—1.5 cm. long, with 5—6 acutely angled vertical ridges: tunics hard, dark brown. *Stem* up to 9 cm. long, usually glabrous, occasionally branching, with 1—2 small scales. *Leaves* 3—16, terminally congested, rarely 1—2

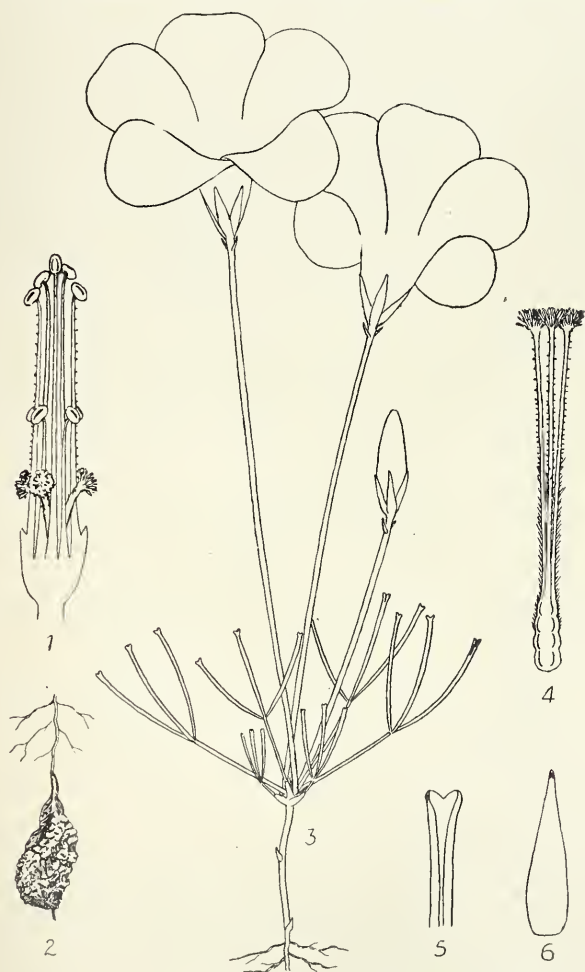


FIG. 57. *Oxalis involuta* Salter. 1. Androecium, showing short styles  $\times 8$ . 2. Bulb  $\times 3$ . 3. Plant  $\times 2$ . 4. Gynaecium  $\times 8$ . 5. Upper end of leaflet  $\times 10$ . 6. Sepal  $\times 6$ . (Salter 3381.)

cauline : petioles slender or filiform, very short or up to 1.2 cm. long : leaflets 3, sessile, linear or narrowly linear-cuneate, 0.5—1 cm. long, often conduplicate, emarginate, glabrous, bicallose at the apex and sometimes with a row of elongate calli near the margins, or ecallose. *Peduncles* 1-flid., terminal, 2—6 cm. long, rarely densely clothed with gland-tipped hairs, with 2 small alternate lanceolate bracts close to the calyx. *Sepals* lanceolate or linear-lanceolate, rarely sparsely puberulous and ciliate, often reddish-purple along the margins, inconspicuously bicallose at the apex or ecallose. *Corolla* 1.2—2.2 cm. long, white, lilaceous or rose, with a funnel-shaped yellow tube : laminae of the petals obovate, obliquely subtruncate, a little longer than the claw, often with a conspicuous reddish-purple outer margin beneath. *Filaments* glabrous or minutely glandular, the shorter 1.5—3 mm., the longer 3—5.5 mm. long, with acute teeth. *Ovary* glabrous or shortly pilose on the upper half, the chambers 3—4-ovuled : styles pubescent below, glandular-pilose above. Seeds without endosperm.

FORM A. Typical. STELLENBOSCH DIV. ; *E. & Z.* 699 (*type*), *Zey.* 245, *S.* 6141 : CAPE DIV. ; *S.* 3440 : MALMESB. DIV. ; *S.A.M.* 48376, *S.* 1035, 2265, 2411, 6096 : TULBAGH DIV. ; Postelynsberg *Drège*, *Schltr.* 7834, *S.* 2648, 2653, 3450, 6144 : WORCES. DIV. ; *B.H.* 21959 : CALEDON DIV. ; *E. & Z.* 691 (*O. semiglauc*a *E. & Z.*), *S.* 1145, 2302, 2307, 6037, 6209. Fl. May—Aug.

*E. & Z.* 700 and *Zey.* 218, cited by Sonder, are *O. pallens* *E. & Z.* I found the bulbs of these two species mixed up in one capsule in Sonder's herbarium.

*Schltr.* 7832 (*O. viscidula* *Schltr.*) has evidently been included here in in Pflrch-Ox. owing to mislabelling of specimens. Reference to Schlechter's description would have at least obviated this error.

Sonder places *Drège* (*O. pusilla* *E. Mey.*), which I have not seen, here, but from the three localities given in *Zwei Pfl. Docum.* (1844), viz. Paarden Island, Blauwberg and Tygerberg, it seems more likely that it is *O. pusilla* *Jacq.*

FORM B. Petioles sparsely and peduncles densely clothed with gland-tipped hairs.

Loc. ? ; *Leipoldt* (*B.H.* 19712, 19765)

This species is usually found in damp places and is distinguished by its angular bulb. There are many local forms, variable in size, in the colour of the flowers and in the presence or absence of calli on the leaflets. Var. *semiglauc*a *Sond.* has no claim for separation. Form B, distinguished above, is perhaps a variety, but the occasional presence of a few gland-tipped hairs on other specimens seems to indicate that there are intermediates.

✱ 161. *O. fragilis* Salter, Journ. of S.A. Bot. I (1935) 134. Slender, caulescent, up to 10 cm. high. *Bulb* small, ovoid, somewhat attenuate at base and apex, up to 9 mm. long: tunics sharply acute at the apex,

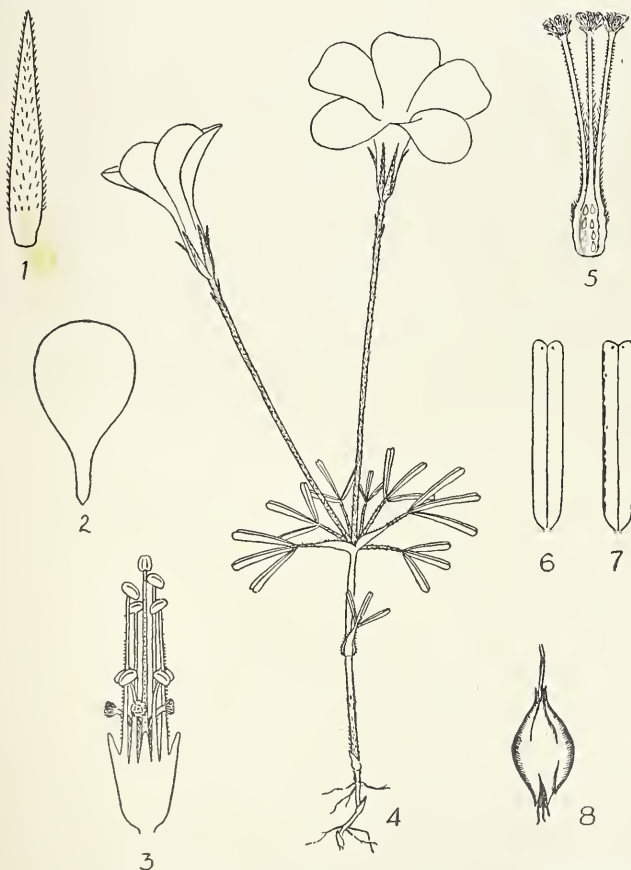


FIG. 58. *Oxalis fragilis* Salter. 1. Sepal  $\times 6$ . 2. Petal  $\times 1\frac{1}{2}$ . 3. Androecium  $\times 8$ . 4. Plant  $\times 1\frac{1}{4}$ . 5. Gynaecium  $\times 8$ . 6. Medial leaflet (open)  $\times 5$ . 7. Leaflet of var.  $\beta$   $\times 5$ . 8. Bulb  $\times 2$ . (Salter 660.)

laevigate, dark brown, lightly nerved. *Rhizome* 2—4 cm. long. *Stem* 2—3 cm. long, simple or rarely bifurcate, pubescent at the base, usually glabrous above, with 1—2 ciliate scales. *Leaves* 7—12, apically congested,

sometimes 1—2 cauline : cauline petioles squamiform, ciliate, the apical 0.5—1 cm. long, pubescent, the outer dilated and ciliate below the articulation : leaflets 3, subsessile, linear, conduplicate, often slightly falcate, 5—8 mm. long, 1—1.5 mm. broad, glabrous, ecallose, or with 2 minute apical calli. *Peduncles* 1-fl., apical, 2—4 cm. long, pubescent, with 2 alternate rubro-callose bracts a little below the calyx. *Sepals* narrowly linear-lanceolate, acute, 6—7 mm. long, sparsely pubescent, ciliate, ecallose. *Corolla* 1.8—2 cm. long, pale straw-coloured, with a funnel-shaped yellow tube : laminae of the petals obovate, sometimes slightly truncate, twice as long as the claw. *Filaments*, the shorter 1.5—3 mm., the longer 3—5.5 mm. long, glandular-pilose on the outer edge, with acute teeth about 0.5 mm. long. *Ovary* pubescent on the upper half, ecallose, the chambers 8-ovuled : styles pubescent below, glabrous or glandular-pilose above. Seeds without endosperm. (Fig. 58.)

MALMESB. DIV. ; by roadside 7 miles north of Moorreesburg (old road to Piquetberg), S. 660 (*type* in Bol. Herb.) 383/3A, 2418, 3427B, 5425, 6104 ; *Pillans* 6647. Fl. May—July.

✱ Var. *β* **pellucida** Salter l.c. *Leaflets* bordered with elongate pellucid calli which turn black in drying. *Corolla* rosy-orange with a yellow tube, the claw of the petals proportionately longer.

Same locality ; S. 5426 (*type*), 2437, 3427.

Both forms seem to be confined to a very limited area, a small isolated unploughed plot in the wheat lands, but the typical form and var. *β* were not mixed in close association. Var. *β* looks like a hybrid with *O. glabra* Th., but I have not observed that species in the vicinity. *O. perineson* Salter & Exell, a caulescent species with reddish flowers and linear leaflets with similar pellucid marginal calli, does, however, grow in association and it is conceivable that these calli and the intermediate coloured flowers might have their origin in hybridisation, but no other acceptable evidence could be detected. All 3 stylar forms occur in var. *β*.

✱ 162. **O. pallens** E. & Z., Enum. I (1836) 89, n. 700.—*O. brachycarpa* Schltr. Caulescent, slender, pubescent, 4—10 cm. high. *Bulb* small, ovoid, acuminate, up to 9 mm. long, with smooth dark brown tunics. *Rhizome* usually 1—3 cm. long, *Stem* 1—5 cm. long. *Leaves* often 10—16, terminally congested : petioles 1—2 cm. long : leaflets 3, sessile, linear or linear-cuneate, conduplicate, emarginate, 2—8 mm. long, glabrous above, pubescent beneath, with or without 2 apical calli. *Peduncles* terminal, 2—5 cm. long, stouter than the petioles, with 2 alternate subulate bracts near the calyx. *Sepals* linear-lanceolate, sometimes slightly attenuate, subacute, 4—5 mm. long, bicallose and often purplish towards the apex. *Corolla* 1.5—2 cm. long, white, with a funnel-shaped yellow tube : petals 4—8 mm. broad, the obovate laminae as long as

or very little longer than the claw. *Filaments*, the shorter 1.5–2.5 mm., the longer 3–5.5 mm. long, shortly glandular-pilose, with longish narrow teeth. *Ovary* pubescent on the upper half, the chambers 2–3-ovuled: styles pubescent below, glandular-pilose above. *Capsule* not exserted. Seeds without endosperm.

CLANW. DIV.; Olifant's River E. & Z. 700 (pars *O. pallens*, type), Zey. 245 (in Herb. Sond.) Schltr. 8495 (cited as *O. glabra* var. *pusilla* in Pfrsch.), *Leipoldt* (B.H. 19693, 19702, 19775), *F. Bolus* (B.H. 14592), Schltr. 8043 (*O. brachycarpa* Schltr.), *Pillans* 6635, 6643, S. 739, 748, 2444, 4427, 5404, 6106: PIQBG. DIV.; Krumm River, Zey. 218, S. 5290, 5430, 7234. Fl. May–June.

Though confused with *O. goniorrhiza* E. & Z. by Sonder, in whose herbarium (Stockholm) the two species are mounted together, with the bulbs mixed together in one capsule, it is quite a distinct species with a smaller, smooth bulb.

163. *O. glabra* Th., Diss. (1781) 19, No. 17, t. 2.—*O. minor* E. & Z.—*O. glabra* Th., vars. *major*, *minor* and *albiflora* Sond.—*O. stenocarpa* Schltr.—*O. obscura* R. Knuth. Caulescent, rather slender, 5–20 cm. high, minutely pubescent or more rarely glabrous. *Bulb* small, ovoid, acute or rarely with a slender apical beak, usually 5–9 mm. long, with smooth dark brown tunics. *Rhizome* short, producing terminal bulbils on long lateral underground stolons or runners. *Stem* slender, rigid, sometimes branching, 1–15 cm. long. *Leaves* few or many, cauline or terminally congested: petioles shorter than or little longer than the leaflets: leaflets linear, oblong or cuneate, emarginate, often conduplicate, usually 0.5–1.5 cm. long, glabrous above, with 2 minute apical calli. *Peduncles* 1-fl., terminal or axillary, 2–10 cm. long, with 2 callus-tipped alternate bracts near to or imbricating the calyx. *Sepals* lanceolate or linear-lanceolate, sometimes acuminate, sharply acute, 5–9 mm. long, glabrous, rarely ciliate or glandular-ciliate, often with narrow purple margins, ecallose or with 2 minute and inconspicuous apical calli. *Corolla* 1.5–3 cm. long, glabrous, reddish-purple, rose, orange-rose or white, with a rather narrow funnel-shaped yellow tube: laminae of the petals obovate, about as long as the narrow claw. *Filaments* very variable in length, the longer sparsely glandular-pilose, with rather long narrow acute teeth. *Ovary* narrow, 1.5–2.5 mm. long, pilose on the upper half or near the apex, the chambers 3–5-ovuled: styles pubescent below, glandular-pilose above. *Capsule* not exserted. Seeds without endosperm.

CLANW. DIV.; Lamb 3565, *Edwards* 223, B.H. 14575, 22232, S. 741, 1680, 7312: PIQBG. DIV.; Schltr. 7907, 7910 (*O. stenocarpa* Schltr.), B.H. 14597, *Pillans* 7387, 7493, S. 2609, 3425, 6694, 8149, 8155, 8156: WELLINGTON DIV.; S. 2655: MALMESB. DIV.; B.H. 14560, S. 1033,



1254, 1255, 3354, 3362, 4527 : PAARL DIV. ; Berg River, Zey. 217 (var. *albiflora* Sond.), S. 3592 : CAPE DIV. ; B.H. 20028, S. 1021, 2671, 3443, 3583 (double white flowers), 6142 : CAPE PENIN. ; E. & Z. 688, 689 (*O. minor* E. & Z.), W-Dod 1087, 1141, MacO. 202, Schltr. 819, 1056, Marl. 5352, Pillans 2494, 2501, B.H. 14573, S. 243/11, 766, 1008, 1161, 3364 (double red flowers), 6100, 6165, 6647, 6648, 6813, 7064 : STELLENBOSCH DIV. ; E. & Z. 686 (*O. ciliaris*) : CALEDON DIV. ; E. & Z. 687 (*O. linearis*), Zey. 2129, S.A.M. 45920, S. 1190, 2306 : WORCES. DIV. ; S. 4539, 5259 : CERES DIV. : S. 2100, 2173 : MONTAGU DIV. ; B.H. 16060, S. 1095. Fl. Apl.—Nov.

The following have previously been erroneously attributed to *O. glabra* :—Zey. 219 (*O. glabra* Th., var. *acuminata* Sond.) and Schltr. 7836, 7880 are *O. leptocalyx* Sond. : Schltr. 8495 is *O. pallens* E. & Z. : MacO. 1714 is *O. pusilla* Jacq.

FORM B. *Leaflets* dotted with numerous orange calli.

CAPE PENIN. ; Marl. 459 : ROBERTSON DIV. ; pass between MacGregor and Greytown, Leipoldt (B.H. 22602).

Very common and often prolific in the Cape Peninsula and surrounding areas, spreading by means of underground stolons and forming large carpets. The species is characterised by its long, sharply acute sepals which sometimes bear 2 minute apical calli. There are numerous micro-varieties and it takes many epharmonic forms. The shade forms produce long stems with cauline leaves and peduncles, particularly in the mountain regions, but such forms do not remain constant in cultivation. Double flowers sometimes, though rarely, occur.

I am unable to distinguish between Sonder's varieties *major* and *minor*, while var. *albiflora*, which often grows in association with the red form, evidently hybridises with it, producing all shades of pinkish flowers, and also does not deserve varietal rank. Var. *pusilla* (Jacq.) Sond. has here been re-instated as a separate species and var. *acuminata* Sond. (Zey. 219) is *O. leptocalyx* Sond.

✓164. *O. pusilla* Jacq. Oxal. (1794) 79, t. 42.—*O. glabra* Th. var. *pusilla* (Jacq.) Sond. Small, slender, 2—10 cm. high, minutely pubescent or almost glabrous, the stem shortly exserted. *Bulb* small, ovoid, acute at the apex, less than 1 cm. long, with smooth dark brown tunics. *Rhizome* short, producing almost sessile bulbils. *Stem* slender, rigid, 0·5—2 or even 3 cm. long, never leafy. *Leaves* usually 6—10, terminally congested : petioles 2 to 3 times as long as the leaflets : leaflets 3, sessile, linear or linear-cuneate, 3—8 mm. long, emarginate, with 2 minute apical calli. *Peduncles* terminal, 1-fl., 0·5—6 cm. long, shorter than or twice as long as the leaves, with 2 callus-tipped alternate bracts near the apex. *Sepals* lanceolate, never acuminate, 3—5 mm. long, always with 2 small

reddish apical calli. *Corolla* 0·6—2 cm. long, white or pale rose, with a widish funnel-shaped pale yellow tube, rarely with a purple eye in the throat: laminae of the petals obovate, tapering to a cuneate claw, often with a rosy outer margin beneath. *Filaments*, the longer gibbous or shortly toothed, glabrous or sparsely glandular-pilose. *Ovary* pubescent on the upper half, the chambers 2—5-ovuled. Seeds without endosperm.

FORM A. Typical. *Corolla* 0·6—2 cm. long, without a purple eye in the throat. Plant often minute.

TULBAGH DIV.; *Schltr.* 7853: STELLENBOSCH DIV.; *E. & Z.* 692, CAPE DIV.; *S.* 3345, 4504: MALMESB. DIV.; *S.A.M.* 4837<sup>6</sup>, *B.H.* 22614, 22617, *Marl.* 10183, *S.* 243/11A, 774, 3918, 6149, 6610, 8640: CAPE PENIN.; *E. & Z.* 690 (*O. minuta*), *MacO.* 1714, *Bolus* 3389, *Schltr.* 827, 1056, *W-Dod* 64, 1080, 1166, 2783, *B.H.* 14520, 14538, 14572, *Marl.* 129, *Pillans* 2554, *S.* 3301, 3431, 3433, 6595, 8099, 8172: STELLENBOSCH, *Parker* 3683. Fl. May—July.

FORM B. *Corolla* 1·2—2·2 cm. long, with a purple eye in the throat. Plant usually more robust.

MALMESB. DIV.; Langebaan, *B.H.* 22618, *S.* 3918.

A close affinity of *O. glabra* Th. and it was placed by Sonder and Knuth as a variety of that species. Its different root-system (production of sessile bulbils), the more obtuse sepals with comparatively conspicuous apical calli and the constant absence of cauline leaves seem, however, to warrant its retention as a species. It is remarkably variable in the size of all its parts, though plants in each colony are fairly constant. Some specimens of the set *S.* 6149 (Darling) are little more than 1 cm. high, with corollas only 6 mm. long. In some localities the plants are much larger with corollas up to 2 cm. long, but every intermediate size is to be found. The variations are not epharmonic.

1465. *O. leptocalyx* Sond., Fl. Cap. I (1860) 320.—*O. versicolor* L., var. *Meyeri* Sond.—*O. glabra* Th., var. *acuminata* Sond. Erect, caulescent, 8—18 cm. high. *Bulb* when mature ovoid or oblong-ovoid, often deformed, 1·5—2·5 cm. long, with dark brown imbricating tunics, the younger lanceolate in outline or narrowly obclaviform, with pale brown undulate tunics. *Rhizome* up to 10 cm. long, without underground stolons. *Stem* subrigid, 5—15 cm. long, rarely branched, glabrous, with a few ciliate scales or abortive leaves. *Leaves* up to 12, usually terminally congested, rarely 1—2 cauline: petioles up to 1 cm. long, the outer and the cauline often squamiform: leaflets 3, sessile, linear, often conduplicate and slightly falcate, emarginate 5—8 mm. long, up to 1·5 mm. broad, glabrous above, pubescent beneath, introrsely ciliate, sometimes minutely bicallose at the apex. *Peduncles* 2—6, 1-fl., up to 3 cm. long, pubescent, with 2 lanceolate carinate ciliate callose bracts a little below the calyx.

*Sepals* linear-lanceolate, sharply acute, 8—9 mm. long, glabrous or sparsely ciliate, pale, ecallose. *Corolla* 1·9—2·6 cm. long, rose-red or rarely white, with a rather narrowly funnel-shaped yellow tube: laminae of the petals obliquely suborbicular, with a darker red outer margin beneath, about as long as the narrow claw. *Filaments* sparsely glandular-pilose, the shorter 3—4·5 mm., the longer 4—6·5 mm. long, unequal, acutely toothed. *Ovary* pubescent on the upper half, the chambers 4—6-ovuled: styles pubescent. Seeds without endosperm.

PIQBG. Div.; *Zey.* 216 (type in Herb. Sond.), *Drège* 3213, Zwartland (*O. versicolor* L., var. *Meyeri* Sond.), Krumrivier, *Zey.* 219 (*O. glabra* Th., var. *acuminata* Sond.), *Edwards* 63, *S.* 4545, 5484, 8122: TULBAGH Div.; *Schltr.* 7836, 7880, *S.* 2168, 2278, 2652, 4491, 6086, 6080: MALMESB. Div.; *B.H.* 22612 (white), *S.* 2433. Fl. May—June.

A close affinity of *O. glabra* Th. and it is very difficult to distinguish in the dried state without the bulb. It differs in having a more robust and rigid stem and a much larger and rougher bulb, the younger bulbs being long and attenuate and quite unlike the small smooth bulbs of *O. glabra* and it does not produce underground stolons.

The sepals are not 'setaceo-acuminate' as described by Sonder. In the specimens in his own herbarium they are *shrivelled* at the apex.

The description in Pflrch-Ox applies to *Schltr.* 7918, an entirely different species (*O. variifolia* Steud., var. *ternata*). The author had not seen the type and trusted to Schlechter's ticket-name.

✓ 166. *O. versicolor* L. Sp. Pl. I (1753) 434.—*O. elongata* Jacq.—*O. versicolor* L., var. *elongata* (Jacq.) Sond.—*O. punctulata* R. Knuth (pars typica). *See form C* Caullescent, usually 8—20 cm. high or taller in shade, almost glabrous or somewhat sparsely pubescent, often with a few gland-tipped hairs. *Bulbs* ovoid, acute or attenuate at the apex, 1·5—2·5 cm. long, often massed together: tunics hard, black, smooth, often slightly gummy. *Rhizome* usually 8—12 cm. long. *Stem* simple, erect, bearing a few scales and often several subsessile leaves or fascicles of leaves, sometimes branching late in the season. *Leaves* usually 8—20, mostly apically congested: petioles slender, 0·5—2 cm. long, rarely longer: leaflets 3, sessile, linear or linear-cuneate, always broadest at the apex, emarginate, usually conduplicate, sometimes slightly falcate, up to 1·8 cm. long, glabrous above, bicallose at the apex, often with a row of calli near the margins. *Peduncles* 1-fl., terminal, usually about twice as long as the leaves, often with short gland-tipped hairs towards the apex: bracts small, callose, alternate, near the calyx. *Sepals* lanceolate or oblong-lanceolate, glandular-pilose, with 2 or sometimes more conspicuous converging apical calli. *Corolla* 1·3—2·5 cm. long, white, with a fairly widely funnel-shaped yellow tube: petals broadly cuneate, rounded at the apex, tapering attenuately to a

short claw, with a conspicuous reddish-purple margin beneath or very rarely concolorous. *Filaments*, the shorter 2.5–5 mm., the longer 3.5–7 mm. long, glandular-pilose, with long acute teeth. *Ovary* pubescent towards the apex, the chambers 2–3-ovuled: styles pubescent below, glandular-pilose above. Seeds without endosperm.

FORM A. Plant sparsely pubescent. *Sepals* oblong-lanceolate, like the upper part of the peduncle clothed with inconspicuous gland-tipped hairs.

CAPE PENIN.; *E. & Z.* 693, *Bolus* 3391, *MacO.* 203, *W-Dod* 1167, 1223, *B.H.* 14536, 14540, 14547, 14584, *Schltr.* 984, *S.* 628, 767, 1291, 1800, 1847, 3303, 4646, 4969, 5420, 6012, 7640, 7736, 8068, 8109, 8113, 8181, *Guthrie* 49: CAPE DIV.; *S.* 4627: MALMESB. DIV.; *S.* 1245, 1343, 6612, 6864, 6866, *Darling*, *S.* 1342: CLANW. DIV.; *S.* 2791: STELLENBOSCH DIV.; *Guthrie* 2472: V. R's DORP DIV.; Karree Berg, *Schltr.* 8230 (possibly an error in locality). Fl. May–Nov.

The most common form, usually growing on the flats.

FORM B. Softly pubescent, entirely without glandular hairs, often with subsessile leaves fascicled on the stem. *Sepals* lanceolate. *Corolla* rarely pale pink. *Filaments* rather shorter.

CAPE PENIN.; *Zey.* (Wynberg), *W-Dod*, 1090, 1099, 1144, 1222, 1271, *S.* 243/12, 619, 620, 1168, 4642, 4988, 5416, 6025, 8103: CAPE DIV.; *S.* 560, 4640: TULBAGH DIV.; Saron, *S.* 4416, 8121.

Usually growing on hill slopes. The two sets from near Saron fall nearest to this form, but in some ways resemble *O. argyrophylla* Salter.

Form C. Red margin on the petals often indistinct or wanting. Plant very sparsely glandular-pilose.

MALMESB. DIV.; *Darling*, *Bolus* 12636, Hopefield, *Bachmann* 87 (*O. punctulata* R. Knuth, *type only*), Groot Post *S.* 6804, 6863.

The remainder of the specimens cited in Pflrch-Ox. under *O. punctulata* are *O. pendulifolia* Salter.

✱ Var. *β flaviflora* Sond. *Corolla* bright yellow: petals with a deep purple margin. Teeth on the longer filaments shorter than in the other forms.

TULBAGH DIV.; Gouda, in wet places, *Burke & Zey.* (Berg River), *Schltr.* 7844, *Leipoldt* (B.H. 19761), *S.* 2276, 5411. Fl. May–June.

Very local and apparently confined to the vicinity of Gouda (formerly called Piquetberg Road). The following cited in Pflrch-Ox. are not this variety:—*Bachmann* 419, *MacO.* 203, *Schltr.* 984, 8230 and certainly none of the Cape Peninsula specimens.\*

\*A specimen of *O. versicolor* L., Form B, is mounted in the Nat. Herb. Pretoria with a ticket *Schltr.*, Iter secundum 7844 (number altered), a different form of ticket from those distributed with var. *flaviflora*. I suspect that the author of Pflrch-Ox. may have been misled by a similar error in distribution and had accepted Schlechter's naming of the wrong plant, apparently having never seen the *type* or, indeed, any genuine specimen of this variety.

*O. versicolor*  
var. *elongata*  
(Jacq.) Sond.  
*O. elongata* Jacq.



Var.  $\gamma$  **latifolia** W.-Dod., Journ. of Bot. XXXVIII (1900) 170. *Leaflets* broader, cuneate. *Peduncles* mostly axillary. Plant usually branching and bearing gland-tipped hairs on all parts.

CAPE PENIN.; Black River, W.-Dod 70 (*type*) Raapenberg, Guthrie 81, Camp's Bay, Pappe 1604: CALEDON DIV.; Hermanus, S. 1187: WORCES. DIV.; Bain's Kloof, S. 6834. Fl. July—Aug.

This variable variety seems to form a link with other species. It is very near to *O. reticulata* Sond. (form *O. oligadenia* Schltr.). The plants from Hermanus and Bain's Kloof appear to be somewhat intermediate with *O. multicaulis* E. & Z. (form *O. polyadenia* Schltr.).

*O. elongata* Jacq. (var. *elongata* (Jacq.) Sond.) is merely an epharmonic form, not a variety. (Schltr. 7825, Durbanville, attributed here in Pflsch-Ox. is *O. falcata* Salter.

Var. *Meyeri* Sond. (*Drège*, Zwartland) is identical with *O. leptocalyx* Sond.

167. **O. polyphylla** Jacq. Oxal. (1794) 75, t. 39.\*—*O. amoena* Jacq.—*O. filifolia* Jacq.—*O. versicolor* Jacq. (non L.) in Ic. Rar. t. 206. (*A group-species*). Erect, caulescent, 5—30 cm. high. *Bulb* ovoid or globose-ovoid, often 2—3 cm. long, the tunics soft, papery, lightish brown, or harder, dark brown, sometimes gummy, with a very hard black coating. *Stem* rather rigid, up to 20 cm. long, glabrous or pubescent, with a few amplexicaul scales. *Leaves* usually 10—30, apically congested: petioles slender, 1—5 cm. long, sparsely pubescent: leaflets 3 (or in vars. 5—7), sessile, linear or narrow-linear, conduplicate, often slightly falcate, 1—3 cm. long, minutely emarginate, entirely glabrous or sparsely pubescent beneath, with 2 conspicuous orange-red apical calli. *Peduncles* 1-fl., apical, 3—10 cm. long, stouter than the petioles, pubescent, with 2 alternate linear or subulate bracts towards the calyx. *Sepals* lanceolate or linear-lanceolate, subobtusate, 5—8 mm. long, pubescent, ciliate, with 2 orange-red apical calli. *Corolla* 1.5—3 cm. long, rose-pink, rosy purple or white, with a rather narrowly funnel-shaped sparsely pubescent yellow tube: laminae of the petals rather narrowly obovate, rounded at the apex, often darkening or buff-coloured towards the outer margin beneath, about as long as the claw. *Filaments*, the shorter 4—6 mm., the longer 6—9 mm. long, minutely glandular-pilose, gibbose or dentate. *Ovary* pubescent on the upper half, ecallose, the chambers 2—3 ovuled: styles pubescent below, glandular-pilose above. *Capsule* sub-globular. Seeds without endosperm.

WELLINGTON DIV.; B.H. 14517: MALMESB. DIV.; E. & Z. 697 (*O. filifolia* Jacq.), S. 784, 2406, 4405, 4524, 5992: CAPE DIV.; S. 564

\*For notes on this species and its varieties see Journ. of S.A. Bot. VI (1940), 191—194.



6594 : CAPE PENIN. ; *E. & Z.* 695 (*O. gracilis*), 696, *MacO.* 1713, *B.H.* 14509, 14513, *W-Dod* 1024 (ex pte.), 1030, *Marl.* 443, *Pillans* 2473, *S.* 243/13, 519, 2039, 3047, 5246, 5247, 6581, 8054, 8066, 8071 : CALEDON DIV. ; *B.H.* 15123, 20442, 22658 ; *Schltr.* 7763, *S.A.M.* 45930, *Galpin* 12671, 12673, *S.* 606, 2115, 3315, 3286, 7204, 7208, 7227 : CERES DIV. ; *B.H.* 22597 : MONTAGU DIV. ; *B.H.* 16059, *S.* 2113 : SWELLENDAM DIV. ; *Thode* A2305 : RIVERSDALE DIV. ; *S.* 2368, 2371, 2375 : M. BAY DIV. ; *Muir* 1378, *S.* 2344, 2351, 3248, 3276 : GEORGE DIV. ; *Schltr.* 2241, *S.* 3176 : HUMANSDORP DIV. ; *S.* 3209, *Thode* A759, *Fourcade* 1181 : P. ELIZ. AND UITENHAGE DIVS. ; *Zey.* 2132, *Bolus* 2220, *B.H.* 19797, 20144, *Paterson* 610, 2728, 2529, *Long* 555, *Galpin* 6401. Fl. March—June.

Unlike most species of *Oxalis* *O. polyphylla* shows a great deal of variation in the bulb. In some forms the tunics are thin and chestnut brown in colour, in others rigid and darker, while sometimes they exude a copious gummy excretion which hardens and forms a shapeless outer coating to the bulb or series of bulbs, which, in the case of old plants may be welded together within it.

This gummy excretion only seems to be present in plants growing in sandy soil and does not occur in those found in gravel or heavier soils, yet colonies growing in almost pure sand may show no trace of it. Nor does it appear to be related to the age of the bulb which in this species is often very long-lived.

(See Introduction Part XII (i) The Bulb and System of Vegetative Reproduction).

Although it only seems possible to treat it as a *group-species*, consisting of a large number of micro-varieties, the following five named varieties, which show definite characters by which they can always be distinguished, are upheld. Otherwise it has not been found possible to correlate the bulb variations with any other distinct character such as the colour of the corolla or the shape of the sepals. The differences in the width of the leaflets are probably entirely due to habitat and conditions of growth.

The dividing line between *O. polyphylla* and *O. falcata* Salter (*O. falcata* Sond.) is somewhat thin. The typical forms are readily separable, but certain intermediates with more pubescence, narrower attenuate sepals (e.g. *S.* 6621, 8388, *Drège* (*O. revoluta* E. Mey. *M.S.*) from Groot Drakenstein, *S.* 3343 and 6605 from near Durbanville, *S.* 4494 from near Paarl, seem to merge progressively from the former species towards the latter.

*Zey.* 218, in Berlin Herbarium, has been cited as *O. polyphylla*, but the specimens bearing this number in Sonder's Herbarium belong to

*O. gracilipes* Schltr., a species only known to the author of Pflrch-Ox. from Schlechter's description.

Previous authors have cited Burmann's figure in Pl. Afr. Rar. tab. 27, f. 1 as *O. polyphylla*. The drawing, particularly of the leaves, is so execrably bad that it is quite unrecognisable.

Var.  $\beta$  **pentaphylla** (Sims) Salter.—*O. pentaphylla* Sims, Bot. Mag. t. 1549.—*O. falcata* E. & Z., non Sond. The majority of the leaves 5-foliate, a few sometimes 3—4-foliate.

CAPE PENIN.; E. & Z. 698, 749 (*O. falcata* E. & Z.), Schltr. 514, 563, W.-Dod 1024 (ex pte.), 1027, 1094, Bolus 4650, B.H. 14525, 14532, S. 618, 3309, 6024, 8092, 8395: CALEDON DIV.; Schltr. 7805 (ex pte.), Galpin 12672: BREDASDORP DIV.; Schltr. 7732, B.H. 20439.

\* Var.  $\gamma$  **heptaphylla**, Salter, Journ. of S.A. Bot. VI (1940) 192. Leaflets, 7, very slender, a few sometimes 5—6-foliate.

CALEDON DIV.; Hermanus, lower slopes of Klein Riv. Mts., Galpin 12670 (type in Bol. Herb.), Schltr. 7805 (ex pte.).

\* Var.  $\delta$  **pubescens** Sond. Rather densely pubescent on all parts. Bulb hard, black, irregular in shape and intensely gummy. Leaflets 3, the apical calli sometimes very inconspicuous or wanting. Peduncles cauline or apical. Sepals linear-lanceolate, attenuate, with or without apical calli. Corolla tube very narrowly funnel-shaped: petals oblanceolate, much narrower than in the typical form, the laminae rosy-purple, pale lilac or white, somewhat acute at the apex. Ovary chambers 1-ovuled.

CLANW. DIV.; Brakfontein, E. & Z. 696  $\beta$  (*O. eglandulosa* E. & Z., undescribed, cited by Sonder and Knuth as *glandulosa*—type) now colourless; white, S. 2067 (cult.); rosy-purple, in sandy ground at the summit of Grey's Pass, Pillans 6683, S. 383/20, 750, 4430, 8123; pale lilac, Warm Baths, F. Bolus (B.H. 14600, 14607, 14626). Fl. May—June.

Some of Mr. Bolus' specimens are elongate with leaflets up to 2 mm. broad and nearly all the peduncles are cauline. These are evidently shade forms. Specimens from open situations produce both cauline and apical peduncles.

\* Var.  $\epsilon$  **alba** Salter, l.c., 194. Plant cano-pubescent. Bulb smaller, broadly ovoid or subglobose, acute at the apex: tunics paler, papery, not gummy. Stem short or scarcely exserted. Leaflets 3. Sepals lanceolate, scarcely attenuate, conspicuously bicallose at the apex. Corolla white, with a funnel-shaped yellow tube: petals purple-streaked or dotted on the outer margin. Ovary chambers 1-ovuled.

CAPE DIV.; Brackenfel, S. 4398 (type in Bol. Herb.), near Stickland, S. 5271: STELLENBOSCH DIV.; near Faure, S. 5251: PAARL DIV.; 12 miles east of Klipheuveel, S. 6013: MALMESB. DIV.; Kalabas Kraal,

*B.H.* 14562, Paardeberg, *S.A.M.* 48369, 48370, near Mamre, *S.* 2071, 8641. Fl. Apl.—May.

A sand-loving variety.

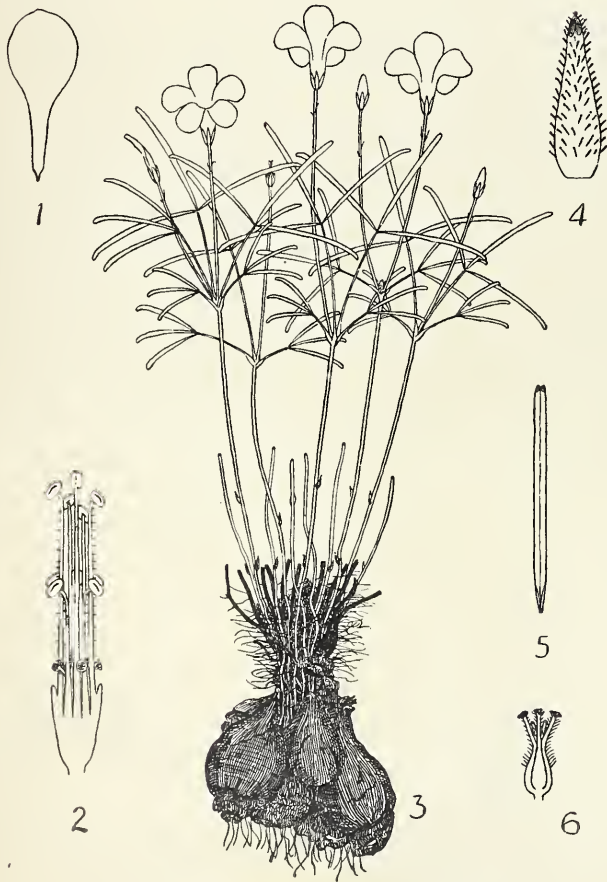


FIG. 59. *Oxalis polyphylla* Jacq., var. *minor* Salter. 1. Petal  $\times 2$ . 2. Androecium  $\times 8$ . 3. Plant, natural size. 4. Sepal  $\times 8$ . 5. Leaflet  $\times 2$ . 6. Gynoecium  $\times 8$ . (Salter 8117.)

\*Var.  $\zeta$  *minor* Salter, l.c., 194. Plant tufted, smaller in all parts. Bulbs congested, gummy. Leaflets 3, narrow-linear, bicallose at the apex.

*Sepals* lanceolate, about 3 mm. long, glandular-pilose, with 2 red apical calli. *Corolla* glandular-pilose, 1—1.3 cm. long, rose, with a yellow tube. *Ovary* chambers 1-ovuled. (Fig. 59.)

WORCES. DIV. ; Bain's Kloof, at the outspan known as "The Haunted House", *Leipoldt* (S. 8117, *type* in Bol. Herb.), Bain's Kloof, near summit, *F. Bolus* (B.H. 14517). Fl. Apl.—May.

Differs from all other forms in its small flowers, with glandular sepals and corolla. The flowers have not increased in size in cultivation. A mountain variety.

\* 168. *O. Burtoniae* Salter, Journ. of S.A. Bot. VII (1942). Slender, erect, caulescent, 6—17 cm. high, finely and sparsely pubescent. *Bulb* globose-ovoid, acute at the apex, slightly attenuate towards the base, about 1.5 cm. long, with smooth blackish-brown tunics. *Rhizome* very slender, 20 cm. or more long, rubescent towards the point of emergence, the scales small. *Stem* 1—9 cm. long, rubescent towards the base, green above, with 1—2 scales. *Leaves* about 6—8, apically congested: petioles filiform, 3—5 cm. long: leaflets 7, more rarely 5—6, shortly petiolulate, linear, conduplicate, minutely emarginate, 1.5—2.5 cm. long, 1—2 mm. broad, glabrous above, with 2 small apical calli. *Peduncles* 1-fld., terminal, 3—8 cm. long, rubescent, with 2 small alternate bracts near the apex. *Sepals* narrow-lanceolate, reddish, about 7 mm. long, ciliate especially on the lower half, with 2 small orange-red apical calli. *Corolla* 2.5—3 cm. long, yellow, with a narrow tube: laminae of the petals broadly obovate, minutely pubescent near the margin, about as long as the narrow claw. *Filaments*, the shorter 3—3.5 mm., the longer 4.5—7 mm. long, glabrous or sparsely glandular-pilose, with short teeth. *Ovary* pubescent on the upper half, the chambers 3-ovuled: styles pubescent below, glandular-pilose above. (Fig. 60.)

MALMESB. DIV. ; Langebaan, *Burton & Leipoldt* (B.H. 22615, *type* in Bol. Herb.). Fl. June.

An affinity of *O. polyphylla* Jacq. and its multifoliate varieties, but differs in having a smaller, differently shaped bulb, narrower, slightly attenuate and more acute sepals, a yellow corolla with a very narrowly funnel-shaped or almost cylindrical tube, the claw of the petal being proportionately longer and narrower and in the marked reddening of the lower part of the stem, the colour extending underground to the upper part of the rhizome.

It has also been observed on kopjes near Paternoster.

\* 169. *O. gracilipes* Schltr., Journ. of Bot. XXXVI (1898) 23.—*O. sphaerocarpa* Weintraub. Erect, caulescent, 5—11 cm. high. *Bulb* ovoid or globose-ovoid, acute at the apex, about 1.5 cm. long: tunics areolate, the inner hard, chestnut-brown, shortly needle-pointed, the

outer papyraceous, pale. *Rhizome* slender, 3—6 cm. long. *Stem* rather rigid, 2—7 cm. long, sparsely pubescent, sometimes with gland-tipped

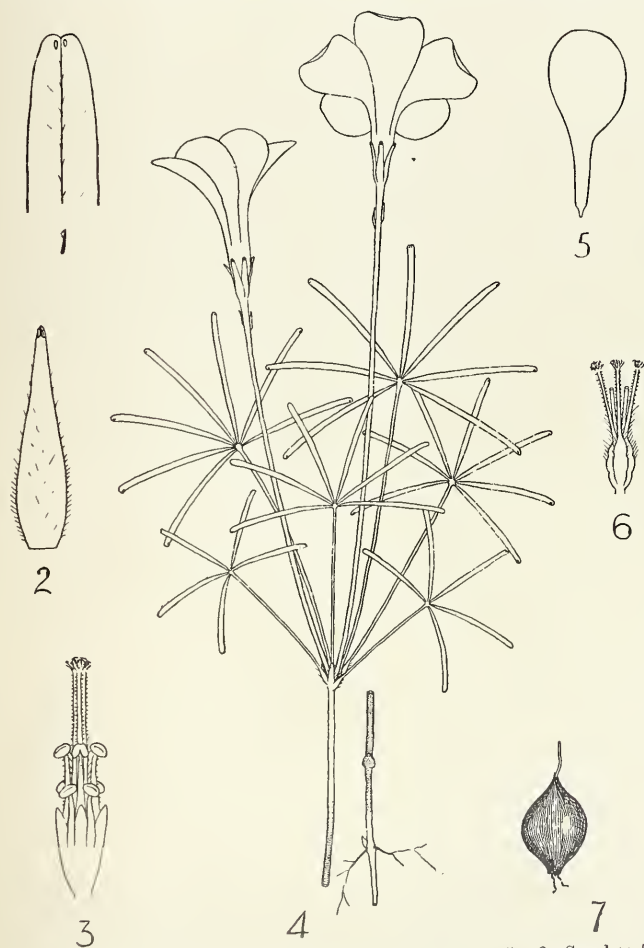


FIG. 60. *Oxalis Burtoniae* Salter. 1. Apex of leaflet  $\times 5$ . 2. Sepal  $\times 5$ . 3. Androecium  $\times 5$ . 4. Plant, natural size. 5. Petal, natural size. 6. Gynoecium  $\times 5$ . 7. Bulb, natural size. (B.H. 22615.)

hairs admixed, with 1—4 pubescent ciliate scales. *Leaves* 5—15, apically congested, or very rarely 1—2 cauline: petioles usually 1—2 cm. long,



pubescent, often with a few gland-tipped hairs admixed: leaflets 3, very shortly petiolulate, linear or linear-cuneate, broadened at the apex, conduplicate, slightly falcate, emarginate, 0·5—1·1 cm. long, glabrous above, pubescent beneath, bicallose at the apex. *Peduncles* 1-fl'd., terminal, 3—6 cm. long, sparsely pubescent, sometimes with gland-tipped hairs admixed on the upper part, with 2 minute alternate bracts towards the calyx. *Sepals* lanceolate, often slightly attenuate, 4—6 mm. long, sometimes with gland-tipped hairs on the lower part, purplish, with 2 small reddish apical calli (black and almost invisible when dry). *Corolla* up to 2 cm. long, white, with a yellow tube: laminae of the petals obliquely obovate, sometimes obscurely buff on the outer margin beneath, slightly longer than the claw. *Filaments*, the shorter 2—3 mm., the longer 3—6 mm. long, unequal, minutely glandular-pilose, with rather acute teeth. *Ovary* pilose on the upper half, ecallose, the chambers 1—2-ovuled: styles pubescent below, glandular-pilose above. Seeds without endosperm.

CLANW. DIV.; Pakhuis, *Leipoldt* 294 (type in S.A. Mus.), *Mader* 2149, between Clanwilliam and Graafwater, *S.* 6691, 7250, Warm Baths, *L. Bolus* (B.H. 14617, *O. sphaerocarpa* Weintroub): *S.* 7311: PIQBG. DIV.; near "The Rest", *S.* 5476, 7236, Kapitein's Kloof, *S.* 8151: Loc. ?, *Zey.* 218 (in Herb. Sond.). Fl. May—June.

Nearly related to *O. pallens* E. & Z., but a larger and stouter plant with a much larger pitted bulb. *O. sphaerocarpa* only differs from the typical form in having gland-tipped hairs intermingled with the pubescence on the peduncles and sepals and occasionally on the stem and petioles. It cannot be considered a different species.

170. *O. falcatula* Salter.—*O. falcata* Sond., non E. & Z. Fl. Cap. I (1860) 322. Erect, caulescent, silky-pubescent, usually 10—18 cm. high. *Bulbs* ovoid, attenuate-acute at the base and apex, 1·5—2 cm. long, often congested: tunics hard, smooth, blackish, sharply acute at the apex. *Rhizome* up to 10 cm. long. *Stem* 3—12 cm. long with a few scales, rarely with 1—2 subsessile leaves. *Leaves* terminally congested, often somewhat tufted, with short petioles: leaflets 3, sessile, linear, conduplicate, falcate, sometimes minutely emarginate, 0·8—1·5 cm. long, glabrous above, thinly silky-pubescent beneath, ciliate, ecallose. *Peduncles* 1-fl'd., terminal and also often arising from the axils of the stem-scales, with 2 alternate subulate pubescent bracts on the upper part. *Sepals* linear-lanceolate, somewhat attenuate or tapering regularly to the apex, 6—8 mm. long, ecallose. *Corolla* 1·4—2·4 cm. long, pubescent, pale rosy pink, with a funnel-shaped yellow tube: laminae of the petals obliquely and rather narrowly obovate, faintly purple along the outer margin beneath, slightly longer than the attenuate claw. *Filaments*,

the shorter 2—3.5 mm., the longer 3—5 mm. long, sparsely glandular-pilose, with subobtusate teeth 0.1—0.2 mm. long. *Ovary* pubescent on the upper half, the chambers 2—3-ovuled: styles pubescent below, glandular-pilose above. Seeds without endosperm.

CAPE PENIN.; Lion's Mt., *E. & Z.* 694 (*O. elongata*, type in Herb. Sond.), *Zey.* 214, *Tyson* 5976, *W-Dod* 1101, *Pillans* 2456, *S.* 243/14, 504, 2069, 3299, 6577, 8091: PAARL DIV.; *S.* 4494: CAPE DIV.; *Schltr.* 7825, *S.* 3343, 6605 (somewhat intermediate with *O. polyphylla* Jacq.). Fl. Apl.—June.

The well known name *falcata* cannot be retained on account of its prior use. *O. falcata* Sond., var. *callosa* Sond. has been raised to the status of a species—*O. argyrophylla* Salter.

171. *O. argyrophylla* Salter.—*O. argentea* R. Knuth, non *E. & Z.* —*O. falcata* Sond. var. *callosa* Sond. Erect, caulescent, silky-canescens, 10—20 cm. high. *Bulb* ovoid, attenuate at the apex or subfusiform, 1—2.5 cm. long: tunics hard, smooth, blackish. *Rhizome* slender, up to 10 cm. long. *Stem* 1—12 cm. long, with a few scales and often with 1—2 subsessile leaves. *Leaves* terminally congested, darkish green, with short petioles: leaflets 3, sessile, linear or linear-cuneate, conduplicate-falcate, slightly emarginate, usually 0.6—1 cm. long, silky-canescens above and beneath, bicallose at the apex, often with a row of calli towards the margins. *Peduncles* 1-fl., 2—6 cm. long, usually apical, sometimes 1—2 longer, arising from the cauline scales, with 2 minute alternate bracts near the calyx. *Sepals* linear-cuneate, somewhat attenuate, 4—6 mm. long, with 2 apical calli. *Corolla* 1.5—2.5 cm. long, pubescent, white or rarely violaceous, with a funnel-shaped yellow tube: laminae of the petals obliquely obovate, reddish-purple or purple-streaked along the outer margin beneath, rather longer than the claw. *Filaments*, the shorter 2—3.5 mm., the longer 3—5 mm. long, sparsely glandular-pilose, with acute teeth 0.6—0.9 mm. long. *Ovary* pubescent on the upper half, the chambers 2—3-ovuled: styles pubescent below, glandular-pubescent above. Seeds without endosperm. Rarely with double flowers.

MALMESB. DIV.; *Drège* in Zwartland (*O. falcata* Sond., var. *callosa* Sond., type in Herb. Sond.), *Backmann* 1015, *B.H.* 14553, 14589, *Marl.* 452, 5352b (double), *S.* 655, 773, 778, 781, 1749, 2413, 2434, 3361, 4516, 5280, 6146, 6588, 6611, 8625, 8629: CAPE PENIN.; *Bolus* 3385, *W-Dod* 1047, *B.H.* 14539, *S.* 573, 5418, 8098: Cape Div.; *B.H.* 21962: STELLENBOSCH DIV.; *Schltr.* 7791 (*O. argentea* R. Knuth). Fl. May—July.

A species with many slight geographical variants. It was not recognised by R. Knuth (who gave it the invalid name of *argentea*) as being the same as *O. falcata*, var. *callosa*. Though closely akin to the foregoing, it differs

in several important characters and should be considered as a separate species.

172. *O. perineson* Salter & Exell, Journ. of Bot. LXVIII (1930) 144. Slender, erect, caulescent, 7—15 cm. high. *Bulb* ovoid, attenuate-acute or rostrate-acute at the apex, 1.5—2 cm. long, with hard blackish-brown tunics. *Rhizome* often 6—8 cm. long. *Stem* slender, wiry, glabrous, with 1—2 scales. *Leaves* 6—20, apically congested, with sparsely pubescent petioles 0.5—1.5 cm. long: leaflets 3, sessile, linear, conduplicate-falcate, slightly emarginate, 0.8—1.2 cm. long, 1—2 mm. broad, glabrous above, sparsely pubescent beneath, inconspicuously bicallose at the apex and edged with a row of small pellucid narrow elongate calli which turn black in drying. *Peduncles* 1-fld., terminal or very rarely arising from the upper scales on the stem, 2—3 cm. long, pubescent, with 2 alternate subulate bracts near the calyx. *Sepals* narrow-linear, sharply acute, 4—7 mm. long, pubescent, ciliate. *Corolla* 1.7—2.1 cm. long, pale lilac or almost white, with a rather short yellow tube: petals 5—7 mm. broad, the laminae elliptical, conspicuously purple-margined beneath, twice as long as the claw. *Filaments*, the shorter 1.5—3 mm., the longer 2.7—5.3 mm. long, glandular-pilose on the outer edge, with long acute teeth. *Ovary* densely pubescent on the upper half, ecallose, the chambers 2—3-ovuled: styles densely pubescent below, glandular-pilose above. Seeds without endosperm.

MALMESB. DIV.; 7 miles north of Moorreesburg (on the old road to Piquetberg) S. 383/6A (type in Herb. Brit. Mus.), 2436, 2438, 5427. Fl. May—June.

Closely allied to *O. argyrophylla* Salter, but differs in its scantier pubescence and narrower leaflets with pellucid calli on the extreme margins. It was growing in association with *O. fragilis* Salter, var. *pellucida*, q.v.

The locality (Grey's Pass) originally given for the type was erroneous.\* The revised and amplified description is founded on the large collecting S. 5427.

173. *O. stictocheila*. Salter, Journ. of S.A. Bot. II (1936) 149. Slender, caulescent, 5—12 cm. high, glabrous except for the ciliate sepals. *Bulb* often 1.5 cm. long, the older globose-ovoid, the younger narrower, attenuate or subrostrate at the apex: tunics rather hard, dark brown, sometimes sparsely hairy, those of the younger bulbs thinner and paler, often slightly undulate. *Rhizome* slender, 6—12 cm. long, with amplexicaul brown scales. *Stem* 1—6 (often 2—3) cm. long, with 1—2 scales

\*I much regret this lapse. The type specimen was misplaced in changing drying papers. On re-collecting this very local species in the original habitat, the error was at once apparent.

or rarely abortive leaves. *Leaves* 4—10, apically congested: petioles filiform, 1—3 cm. long: leaflets 3, minutely petiolulate, oblong-lanceolate, semi-conduplicate, slightly falcate, minutely emarginate, often 1—1.5 cm. long, minutely bicallose at the apex, bordered on the extreme margin with short orange pellucid calli which turn black in drying. *Peduncles*

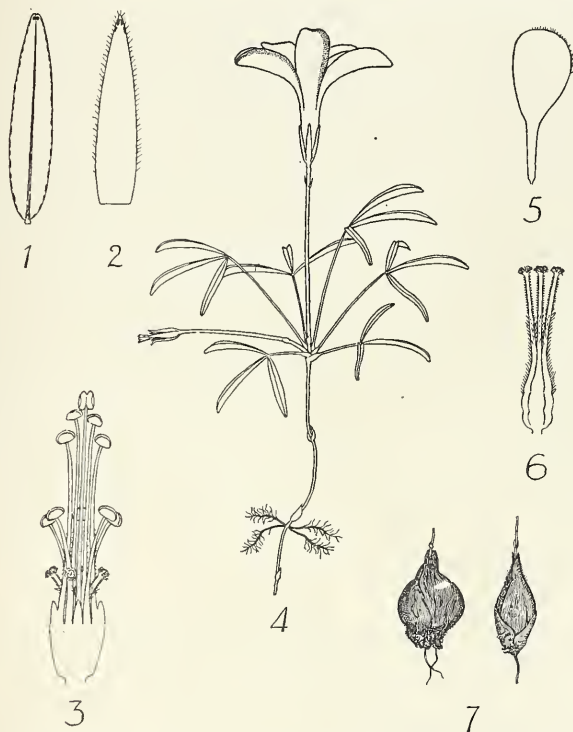


FIG. 61. *Oxalis stictocheila*, Salter. 1. Leaflet, under side (dried)  $\times 2$ . 2. Sepal  $\times 5$ . 3. Androecium  $\times 6$ . 4. Plant, natural size. 5. Petal, natural size. 6. Gynaecium  $\times 6$ . 7. Bulbs, natural size. (Salter 6147.)

1-fl'd., terminal, generally longer than the leaves, with 2 small alternate subulate callose bracts towards the apex. *Sepals* lanceolate, 4.5—6 mm. long, ciliate, with 2 or rarely 4 apical calli. *Corolla* 2—2.8 cm. long, white, with a narrowly funnel-shaped yellow tube: laminae of the petals obliquely obovate, narrowly margined with either purple or dull yellow beneath, often minutely ciliate, a little longer than the narrow-



claw. *Filaments*, the shorter 3—4.5 mm., the longer 5—7 mm. long, glandular-pilose on the lower half, shortly toothed. *Ovary* pubescent on the upper half, the chambers 3-ovuled : styles pubescent below, densely glandular-pilose above. Seeds without endosperm. (Fig. 61.)

MALMESB. DIV. ; roadside between Darling and Yserfontein, S. 6147 (*type* in Bol. Herb.), 2407. Fl. June—July.

\* 174. *O. levis* Salter, Journ. of S.A. Bot. I (1935) 118. Dwarf, with a short stem or stemless, often somewhat tufted, up to 3 cm. high. *Bulbs* often congested, narrow-ovoid, attenuate and acute at the apex, up to 2 cm. long, with smooth blackish-brown polished tunics. *Rhizome* about 6 cm. long. *Stem* up to 4 mm. long, glabrous, with 1—2 amplexicaul scales. *Leaves* 2—5, basal or apically congested : petioles filiform, dark brown, glabrous, about 1 cm. long : leaflets 3, sessile, linear, conduplicate or rarely involute, slightly emarginate, up to 9 mm. long, scarcely 1 mm. broad, glabrous, ecallose, dark green beneath, glaucous above. *Peduncles* 1—3, 1-fl., as long as the petioles, glabrous or very sparsely pubescent above, with 2 small alternate reddish bracts near the apex. *Sepals* oblong-lanceolate, subobtus, 3—4 mm. long, rarely sparsely pubescent, ciliate on the upper part, with 2 inconspicuous apical calli. *Corolla* 1.5—1.9 cm. long, white or very pale violaceous, with a funnel-shaped yellow tube : petals somewhat obliquely narrow-cuneate, slightly attenuate at the base, rounded at the apex, 5—6 mm. broad. *Filaments* glabrous, very shortly connate, the longer 4.5—5.5 mm. long, edentate. *Ovary* globose-ovoid, 1 mm. long, pubescent on the upper half, ecallose, the chambers 1—2-ovuled : styles sparsely pubescent below, minutely glandular-pilose above. Seeds without endosperm. (Short-styled form not seen.) (Fig. 62.)

MALMESB. DIV. ; flats between Malmesbury and Mamre Road Station, in white clay, overlaid with a thin layer of sandy soil, S. 3358 (*type* in Bol. Herb.). Fl. June. Apparently very local.

175. *O. ciliaris* Jacq. Oxal. (1794) 66, t. 30.—*O. Mundtii* Sond., vars. *minor*, *albiflora* and *ferruginea*.—*O. georgensis* R. Knuth.—*O. rubricalyx* Salter & Exell.—*O. Rustii* R. Knuth. (*A group-species.*) Erect, caulescent, more or less pubescent, sometimes with gland-tipped hairs admixed, 3—30 cm. high. *Bulb* ovoid or oblong-ovoid, acute or attenuate at the apex, usually 1.5—2.5 cm. long, with rather thin brown tunics. *Rhizome* sometimes producing lateral underground stolons. *Stem* 1—20 cm. long, robust or slender, rarely branched, with pilose amplexicaul scales and sometimes a few subsessile leaves or abortive leafy branchlets. *Leaves* terminally clustered : petioles as long as or longer than the leaflets, the outer often short, squamiform and sometimes indistinctly rubro-callose on the margins : leaflets 3, sessile, from oblong to linear or in



shade plants sub-elliptical or obovate-oblong, often conduplicate and slightly falcate, emarginate, commonly 0.6—1.2 cm. long, glabrous above, adpresso-pilose and rarely with gland-tipped hairs on the midrib beneath, ciliate with both spreading and introrse hairs, inconspicuously pustulate with callose dots and rarely with 2 or more elongate apical calli. *Peduncles* 1-fl., terminal or rarely cauline, often 2—5 cm. long, with 2 small alternate linear bracts towards the calyx. *Sepals* lanceolate, 3—7 mm. long, pubescent, ciliate, often rather dull red along the margins. *Corolla* 1.3—3 cm. long, rose-red, lilaceous, white or salmon-pink, with a bright

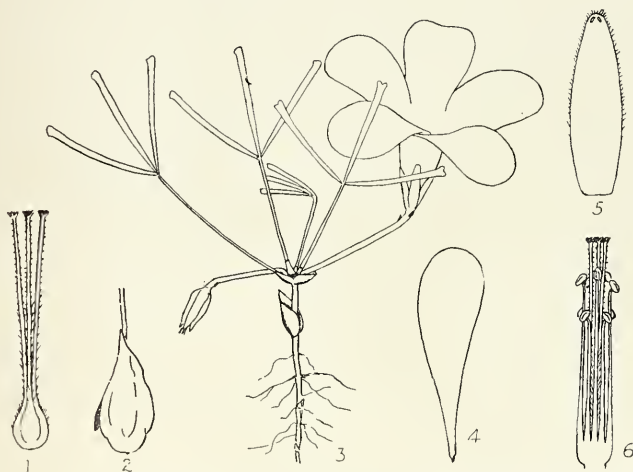


FIG. 62. *Oxalis levis* Salter. 1. Gynaecium  $\times 6$ . 2. Bulb, natural size. 3. Plant  $\times 2$ . 4. Petal  $\times 2$ . 5. Sepal  $\times 8$ . 6. Androecium, showing long styles  $\times 6$ . (Salter 3358.)

yellow funnel-shaped tube: laminae of the petals obovate, about as long as the attenuate claw. *Filaments* minutely glandular-pilose, the longer edentate. *Ovary* pubescent on the upper half, with orange-red calli at least on the upper part, the chambers 2—5-ovuled: styles pilose with both simple and gland-tipped hairs. Seeds without endosperm.

FORM A. Typical. Usually rather stout, the hairs all simple. *Corolla* rose-red or white.

ALEXANDRIA DIV.; Galpin 10804, Holland (Nat. Bot. Gar. Kirst. 1352/35): KNYSNA DIV.; Pillans 6651, Duthie 1222, 1225: P. FLIZ. DIV.; Galpin 6406, 6407: UNIONDALE DIV.; Pillans 6650, Compton 5240, 5243, 5245, S. 3201, 3202, 3205, 3233: GEORGE DIV.; Schltr.

2238 (*O. georgensis* R. Knuth), *S.* 3160, 3182 : OUDTSHOORN DIV. ; *S.* 2340 : MOSSEL B. DIV. ; *S.* 376/59 (*O. rubricalyx* Salter & Exell), 2354, 3274, 3275 : RIVERSDALE DIV. ; *S.* 2381, 6792, 6793, *Muir* 1346, 2023, 2626, 2953, *Rogers* 4356, *B.H.* 20107, 20108 : SWELLENDAM DIV. ; *Mundt* (*O. Mundtii* Sond., var. *ferruginea*), *S.* 2390, 2391 : BREDASDORP DIV. ; *Galpin* 4946. Fl. Apl.—July.

FORM B. Plants as in Form A. Gland-tipped hairs admixed with the simple hairs on all the herbaceous parts. *Corolla* rose-red or white.

MOSSEL B. DIV. ; *Compton* 5246, *S.* 2358, 2364 : RIVERSDALE DIV. ; *Rust* 519 (*O. Rustii* R. Knuth), *Muir* 2207, 2590, *B.H.* 20111, *S.* 2367, 2369, 2370, 2374 : WORCES. DIV. ; *S.* 2179, 6044 : CERES DIV. ; *Leipoldt* *B.H.* 22595, 22599.

FORM C. Smaller mountain form. *Leaflets* often narrower. *Hairs* all simple. *Corolla* rose-red, lilaceous or white.

WORCES. DIV. ; *Zey.* 248\*, 255 (*O. Mundtii* Sond., var. *minor*), *Zey.* 250 (*O. Mundtii* Sond., var. *albiflora*) *S.* 6051 : TULBAGH DIV. ; *Marl.* 9082 : CERES DIV. ; *Wolverivier*, *S.* 2213, 6064, *B.H.* 19713, 19715 : LAINGSBURG DIV. ; *S.* 6057 : MONTAGU DIV. *S.* 1078, 2319, 2320 ; *Barker* 1011 : SWELLENDAM DIV. ; *S.* 2322, 2327.

FORM D. Smaller, rather lax. *Hairs* all simple. *Corolla* deep salmon pink, with the tube often wider than in the typical form.

MONTAGU DIV. ; *S.* 1048, 2317, 6073.

Var.  $\beta$  **Pageae** (L. Bolus) Salter, var. nov.—*O. Pageae* L. Bolus, *Journ. of Bot.* LXVI (1928) 10. Plant rather lax, finely pubescent, with longer gland-tipped hairs admixed. *Corolla* viscous, small, 1.3—1.7 cm. long, golden yellow, with the upper half of the laminae of the petals deep salmon-coloured. *Ovary* glandular-pilose.

MONTAGU DIV. ; Donker Kloof, *Page* (*B.H.* 17473, *cult.*, *O. Pageae* L. Bolus).

The exceptionally wide leaflets, due to cultivation, and the exaggeration of the red calli at the bases of the petioles in Jacquin's tab. 30 have, without doubt, been factors which have prevented botanists from recognising this very variable and common species. The latter character is not often distinguishable in living plants and never in dried specimens. The numerous forms vary very much in size, indument (glandular or eglandular), width of the leaflets and in the colour of the corolla. With the exception of var. *Pageae*, I have only been able to divide the specimens into four somewhat indeterminate Forms. Although in each separate colony the plants are usually more or less uniform, mixed colonies do occur.

\*See Introduction, Part III, Errors in Zeyher's localities.

The *types*, in Herb. Sond., of *O. Mundtii* and its varieties are all rather starved, but they undoubtedly belong here. The curious rusty appearance of the upper face of the leaflets in var. *ferruginea* Sond. is a character which appears in some specimens after drying.

The production of underground stolons in this species does not appear to be general, though this character has been observed in a few sets of dried specimens of most of the Forms. They have not developed on any of the plants which have been under cultivation and it is not definitely known that they produce terminal bulbils. The question requires further investigation

\*176. *O. Burkei* Sond. Fl. Cap. I (1890) 320.—*O. minutifolia* Bolus f. Small, erect, caulescent, very slender, sparsely and minutely pubescent, 3—9 cm. high. *Bulb* more or less ovoid, acute or shortly attenuate at the apex, 1—2 cm. long, with pale chestnut-brown tunics. *Rhizome* slender, pale, often 5—7 cm. long. *Stem* wiry, occasionally branched, 1—6 cm. long, with 1 or more amplexicaul scales. *Leaves* few or many, terminally congested: petioles filiform, 0.5—2 cm. long: leaflets 3, sessile, narrow-linear, conduplicate, often falcate, minutely emarginate, 0.3—1 cm. long, glabrous above, sparsely pubescent beneath, *not* ciliate, usually with 2 or more reddish calli near the apex and sometimes obscurely and minutely callus-dotted on the upper part. *Peduncles* 1-fl., terminal, often 1.5—2.5 cm. long, with 2 small subulate ciliate bracts a little below the calyx. *Sepals* more or less broadly lanceolate, up to 3 mm. long, ciliate, often purplish at the apex and margins, inconspicuously bicallose at the apex. *Corolla* 1.2—1.7 cm. long, glabrous, rose, lilaceous or white, with a bright yellow funnel-shaped tube, rarely with a purple eye in the throat: laminae of the petals obliquely obovate, a little longer than the tapering claw, rarely purple-maculate on the outer margin beneath. *Filaments*, the shorter 3—4 mm., the longer 4—6.5 mm. long, minutely glandular-pilose, unequal. *Ovary* narrow-oblong, sparsely pubescent on the upper half, inconspicuously callose at the apex, the chambers 4—5-ovuled: styles sparsely pubescent below, glandular-pilose above. Seeds without endosperm.

LAINGSBURG Div.; Driekop, *Burke & Zey*. 257 (*type* in Herb. Sond.), *Compton* 5303, *F. Bolus* (B.H. 13381, *O. minutifolia* Bolus f.), *Esterhuysen* 5169, *S.* 2207: CERES Div.; *Leipoldt* (B.H. 19714), *S.* 2218, 6061: MONTAGU Div.; *S.* 6069: WORCES. Div.; *L. Bolus* (B.H. 21356), *S.* 2186, 2194, 6046: CERES Div.; *Esterhuysen* 5201. Fl. May—June.

Very closely related to some of the small forms of *O. ciliaris* Jacq., but differing in its thin, scant pubescence, paler bulb tunics, eciliate leaflets and entirely glabrous corolla.

Var. *β multiglandulosa* Sond. is an entirely separate species. with

a quite different bulb. This has been named *O. leptogramma* Salter.

- \* 177. *O. cuneata* Jacq. Oxal. (1794) 76 t. 40.—*O. cuneifolia* Jacq. Erect, caulescent, rather densely hirtellous, 4—8 cm. high. *Bulb* ovoid, acute at the apex, up to 2.5 cm. long, with smooth brown easily separable tunics, the inner paler. *Rhizome* often 6 cm. long, with smooth amplexicaul scales. *Stem* erect, 1—6 cm. long, with 1—6 puberulous scales. *Leaves* numerous, with slender petioles 1—2 cm. long: leaflets 3, sessile, subequal, cuneate, rounded and slightly incised at the apex, 4—8 mm. long, pilose above and beneath, ciliate often with introrse hairs. *Peduncles* 1-fl., apical, 1—2 cm. long, with 2 alternate linear bracts close to the calyx. *Sepals* lanceolate, 4—5 mm. long, dark purple at the apex, ecallose. *Corolla* 1.5—1.8 cm. long, white, with a fairly widely funnel-shaped yellow tube: petals cuneate, slightly attenuate below, subtruncate and dotted with minute reddish calli towards the apex. *Filaments*, the shorter 2.5—5 mm., the longer 4.5—7.5 mm. long, sparsely and minutely glandular-pilose, edentate. *Ovary* hirsute on the upper half, the chambers 3-ovuled: styles sparsely glandular-pilose. Seeds without endosperm.

V. R's DORP DIV.; 15 miles north-west of Bitterfontein, *S.* 6643. Fl. June.

The above is a description of the wild plant. Jacquin's figure of a cultivated plant is lax and does not show the normal habit.

- \* 178. *O. oreophila* Salter, sp. nov. Caulescens, gracilis, sericeo-pubescent. *Bulbus* ovoideus, 1.5—2 cm. longus. *Caulis* rigidus, 3—12 cm. longus. *Folia* apicalia, petiolis ad 1.4 cm. longis: foliola 3, falcata, conduplicata, supra glabra et copiose minuteque callosa-punctata, introrse ciliata. *Sepala* lanceolata, attenuata, 4—5 mm. longa, ecallosa. *Corolla* 1.5—1.8 cm. longa, alba; petala infra rubro-marginata. *Ovarium* callosum, loculis 2-ovulatis: stylis superne pluricellulari-pilosis.

Erect, slender, caulescent, 6—16 cm. high, shortly silky-pubescent on all parts. *Bulb* ovoid, acute at the apex, 1.5—2 cm. long, with soft brown tunics. *Rhizome* rather short. *Stem* slender, wiry, 3—12 cm. long, with several scales or rarely small abortive leaves. *Leaves* 8—12, apically congested: petioles pubescent, the outer short, squamiform, the inner 0.3—1.4 cm. long: leaflets 3, sessile, linear or linear-cuneate, 3—5 mm. long, conduplicate, falcate, obtuse, silky-pubescent beneath, glabrous and copiously punctate with minute reddish-brown calli above, introrsely ciliate. *Peduncles* 1-fl., 1.5—5 cm. long, with 2 alternate reddish linear bracts, about 2 mm. long, on the upper part. *Sepals* lanceolate, attenuate to the apex, 4—5 mm. long, pale, ecallose. *Corolla* 1.5—1.8 cm. long, white, rather sparsely glandular-pubescent, with a funnel-shaped yellow tube: petals cuneate, slightly attenuate to the base,

4—6 mm. broad, with a conspicuous narrow purple outer margin beneath. Filaments, the shorter 2.5—4 mm., the longer 4—7.5 mm. long, very

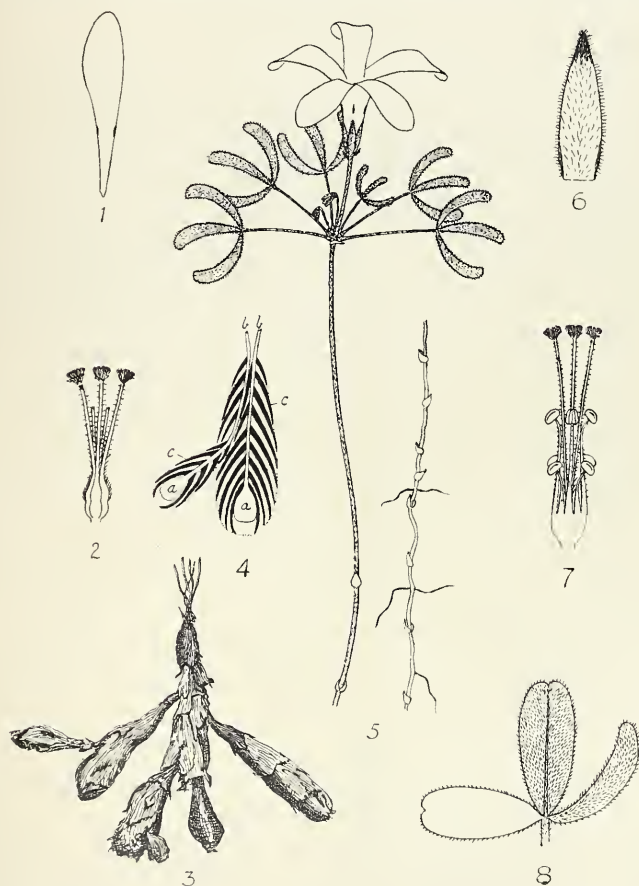


FIG. 63. *Oxalis blastorrhiza* Salter. 1. Petal  $\times 2$ . 2. Gynaecium  $\times 6$ . 3. Bulbs, natural size. 4. Diagram showing course of rhizomes through bulb tunics: a.a. living nuclei, b.b. rhizomes, c.c. bulb tunics (not to scale). 5. Plant  $\times 2$ . 6. Sepal  $\times 9$ . 7. Androecium  $\times 6$ . 8. Leaf, showing upper and under sides of leaflets  $\times 4$ . (Salter 5607.)

unequal, pluricellular-pilose, edentate. Ovary small, pubescent on the upper part, with reddish-brown calli, the chambers 2-ovuled: styles



pubescent below, pluricellular-pilose above. *Capsule* globular. Seeds without endosperm.

CLANW. Div. ; summit of Pakhuis Pass, *S.* 5397 (*type* in Bol. Herb.), 2140, 8135, *Leipoldt* (B.H. 19691). Fl. May—June.

Distributed as *O. falcata* Sond.

- \* 179. *O. blastorrhiza* Salter, Journ. of S.A. Bot. II (1936) 47. Slender, caulescent, 3—5 cm. high, usually somewhat tufted. *Bulbs* lanceolate or elongate-lanceolate in outline, often slightly tortuous, up to 4.5 cm. long, congested, the bulbils budding from within the old bulb, forming a structure which resembles a branched tuber: tunics papery, imbricate. *Rhizomes*, both the living and the previous years', closely fascicled, up to 6 cm. long, arising together through the apex of the old parent bulb. *Stem* rigid, up to 4 cm. long, rarely branched, dark green, minutely pubescent, with 1—2 scales. *Leaves* 6—12, apically congested: petioles pubescent, 0.5—1.5 cm. long: leaflets 3, linear-oblong, often slightly cuneate, conduplicate-falcate, emarginate, 5—9 mm. long, 1.5—3 mm. broad, glabrous above, pubescent beneath, ciliate. *Peduncles* 1-fl., terminal, 5—8 mm. long, pubescent, with 2 small subulate ciliate bracts often imbricating the calyx. *Sepals* broadly lanceolate, 2.5—3 mm. long, pubescent, crispato-ciliate, purple-margined below, blackish towards the apex, with 2 elongate apical calli. *Corolla* 1.2—1.5 cm. long, pale lilaceous, with a somewhat narrowly funnel-shaped yellow tube: petals oblanceolate, attenuate at the base or subspathulate, 2.5—3 mm. broad, violet-veined, with 2 purple marginal striae about 1 mm. long, a little below the middle. *Filaments*, the shorter 2—3.5 mm., the longer 3—6 mm. long, glandular-pilose, edentate. *Ovary* pubescent on the upper half, ecallose, the chambers 2-ovuled: styles pubescent at the base, pluricellular-pilose above. Seeds without endosperm. (Fig. 63.)

V.R.'s DORP Div. ; 4 miles north of V.R.'s Dorp, *S.* 5607 (*type* in Bol. Herb.). Fl. July.

It is possible that the bulb-system is somewhat similar to that of the following species, but with much shorter droppers.

- \* 180. *O. Creaseyi* Salter, Journ. of S.A. Bot. IV (1938) 13. Small, glaucous, sericeous, shortly caulescent, 3—4 cm. high. *Bulb* narrow-ovoid, attenuate at the apex, up to 1.5 cm. long, the outer tunics papery, brown. *Rhizome* 4—6 cm. long, scaly, sheathed in a soft brown cortex.\* *Bulbils* produced inversely at the apices of descending stolons or runners which arise both from the rhizome and the bulb. *Stem* erect, sericeous,

\*For notes on the underground system and formation of this sheath see Introduction, Part XII (i), The Bulb and system of vegetative reproduction, and Fig. 2.

0.5—1 cm. long, with a few amplexicaul brown scales. *Leaves* densely imbricate towards the apex of the stem : petioles up to 6 mm. long,

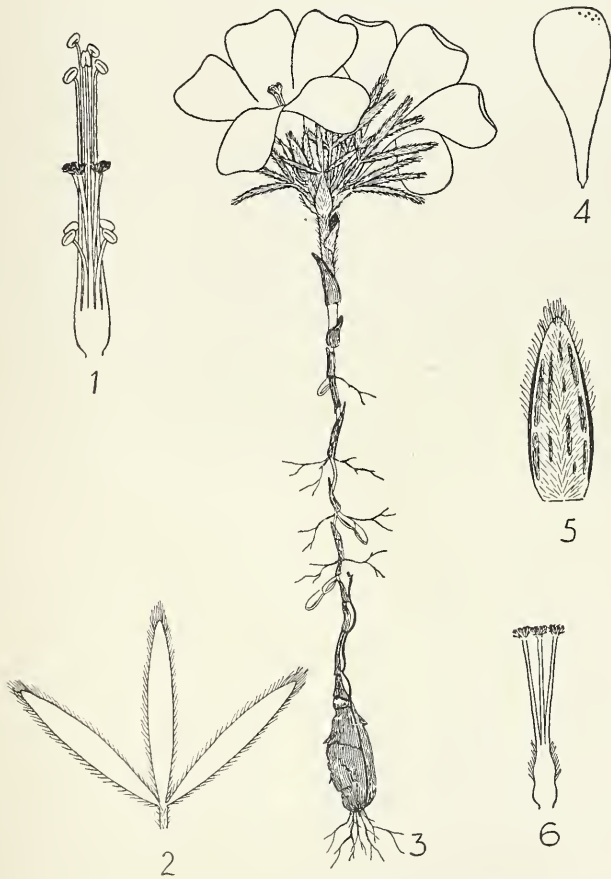


FIG. 64. *Oxalis Creaseyi* Salter. 1. Androecium  $\times 5$ . 2. Leaf, upper side  $\times 3$ . 3. Plant  $\times 1\frac{1}{2}$ . 4. Petal  $\times 1\frac{1}{2}$ . 5. Sepal  $\times 6$ . 6. Gynoecium  $\times 5$ . (Salter 6680.)

the outer squamiform : leaflets 3, sessile, linear, involute-conduplicate, 0.6—1 cm. long, glaucous, glabrous above, inconspicuously callus-dotted, silky with adpressed hairs beneath, ciliate, subacute and penicillate at

the apex. *Peduncles* 1-flid., axillary, 3—7 mm. long, sparsely sericeous, with 2 alternate linear rubro-callose bracts imbricating the calyx. *Sepals* lanceolate, 4—5 mm. long, sparsely hairy, penicillate, narrowly purple-margined, with several elongate apical calli. *Corolla* about 1.8 cm. long, white, with a pale yellow funnel-shaped tube: petals obovate, attenuate to a short claw or sub-cuneate, sub-rotund at the apex, with minute red calli near the anterior margin. *Filaments* glabrous or very sparsely glandular, the shorter 3—7 mm., the longer 6—10 mm. long, edentate, the longest unequal. *Ovary* cano-pubescent on the upper half, with vermilion calli near the apex, the chambers 1—2-(usually 2-ovuled): styles glabrous or very sparsely pubescent. Seeds without endosperm. (Fig. 64.)

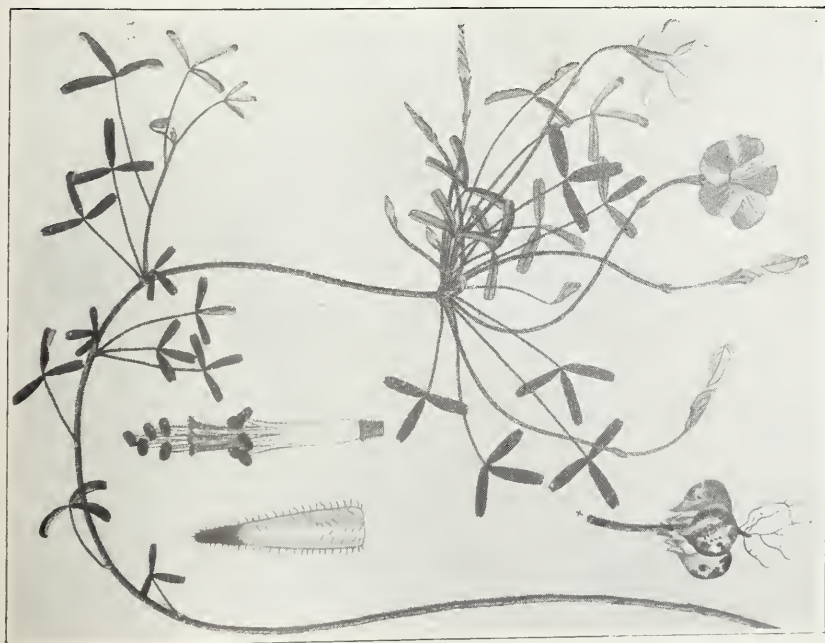
NAMAQ.; between Garies and Leliefontein, 22 miles north-east of Garies, S. 6680 (*type* in Bol. Herb.). Fl. June.

The first leaf produced by the seedling is 3-, 4- or 5-foliate. This species has hybridised with *O. macra* in cultivation. (See Sp. 139A).

✱ 181. *O. Comptonii* Salter, Journ. of S.A. Bot. V (1939) 43. Small, caulescent, slender, 5—12 cm. high, the stem, petioles and peduncles minutely pubescent, with capitate hairs admixed. *Bulb* small, ovoid, scarcely 1 cm. long, with brown papery tunics. *Rhizome* slender, pale. *Stem* up to 7 cm. long or scarcely exerted, dark green, sometimes with 1—2 small scales. *Leaves* about 10, apically congested: petioles 0.5—1.5 cm. long: leaflets 3, subsessile, oblong, narrow-elliptical or linear, obtuse, slightly incised at the apex, sometimes conduplicate, 3—7 mm. long, 1—2 mm. broad, glabrous above, very sparsely pubescent or glabrous beneath, eciliate, with 2 apical calli. *Peduncles* 1-flid., terminal, 2—4 cm. long, with 1—2 minute alternate bracts near the calyx or ebracteate. *Sepals* lanceolate, 3—4 mm. long, glabrous or sparsely pubescent, ciliate, with 2 conspicuous reddish apical calli. *Corolla* 1.4—1.8 cm. long, white or very pale rose, with a funnel-shaped greenish-yellow tube: petals subcuneate, slightly attenuate to the base, rounded at the apex, 4—7 mm. broad, often pale rose on the outer margin beneath. *Filaments*, the shorter 2.5—5 mm., the longer 4.5—7 mm. long, minutely glandular-pilose, edentate. *Ovary* pubescent on the upper part, ecallose, the chambers 2—3-ovuled: styles pubescent below, sparsely and minutely glandular-pilose above. Seeds without endosperm.

V.R.'s DORP Div.; Gift Berg, S. 7286 (*type* in Bol. Herb.), 7292. Fl. May—June.

✱ 182. *O. reclinata* Jacq. Oxal. (1794) 70, t. 34.—*O. ramigera* Sond.—*O. gymnoclada* Turcz.—*O. gracilis* Jacq., var. *reclinata* Sond. Tall, erect, caulescent, branched, often 20—30 cm. high, minutely pubescent with whitish, often crispate hairs, rarely with a few gland-tipped hairs ad-



(i) *O. reclinata* Jacq. (from Jacquin's *Oxalis*, tab. 34), grown in Vienna.  
 PLATE IX.



(ii) Wild specimens (Salter 5345).  
 [Photo: R. S. Adamson.]



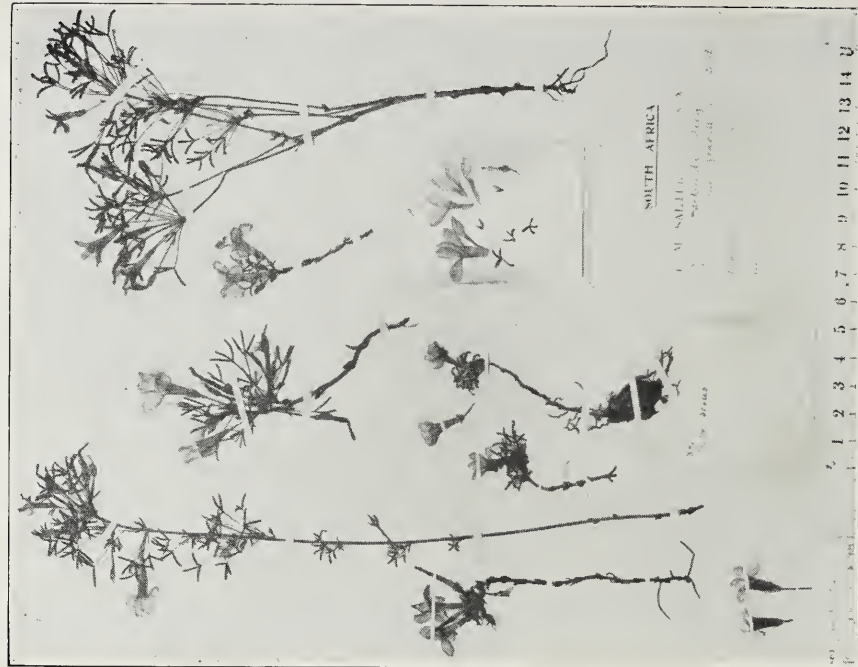


PLATE X.

(i) *O. reclinata* Jacq., var. *quinata* Salter,  
the scale is cultivated. (Salter 6646.)

The specimen just above

(ii) *O. reclinata* Jacq., var. *gracillima* Salter (Salter 801.)  
[Photo: R. S. Adamson.]



mixed. *Bulb* large, ovoid, the outer tunics soft, papery, brown, easily separable. *Rhizome* subligneous, often 15 cm. long, with broad amplexicaul scales. *Stem* erect, or in shade or cultivation sometimes reclinate, green, pubescent, sparsely scaly below, with long or short branches above, the lower sometimes reduced to leaf-tufts. *Leaves* numerous, terminally clustered on the branches and branchlets: petioles slender, from a few mm. to 4 cm. long: leaflets 3, linear-cuneate or narrowly cuneate-ovate, usually conduplicate-falcate, slightly emarginate, 0.2—1 cm. long, glabrous above, pubescent beneath. *Peduncles* 1-fl., terminal, stouter than the petioles, 1.4—4 cm. long, with 2 alternate linear bracts towards the calyx. *Sepals* linear-lanceolate, slightly attenuate, scarcely acute, reddish, sometimes minutely bicallose and nigrescent at the apex. *Corolla* 2—3 cm. long, salmon-pink or pale lilac, with a narrowly funnel-shaped pubescent yellow or greenish-yellow tube: laminae of the petals narrow-obovate, pubescent along the outer margin beneath, a little longer than the narrow claw. *Filaments* glandular-pilose, the longer 8—9 mm. long, edentate. *Ovary* narrow, cano-pubescent on the upper half, the chambers 2-ovuled: styles pubescent towards the base. Seeds without endosperm. (Plate IX (ii).)

V.R.'s DORP DIV.; Bitterfontein district, *Zey.* 207 (*O. gymnoclada* Turcz., *O. ramigera* Sond.) in which the flowers are now colourless; salmon-pink, *S.* 5340, 5345, pale lilac, *S.* 5341. Fl. May—June.

This species may be at once recognised from *O. gracilis* \* Jacq. by its green (not brown, polished) stem. The name is unfortunate, for in the wild state the stem is usually erect, although in cultivation it has assumed the lax procumbent habit depicted by Jacquin. (See plate IX (i)). My specimen *S.* 5345 was compared with Jacquin's *type* at Vienna and found to agree as it also undoubtedly does with *Zey.* 207 from the same locality. The two colour forms are identical in all other respects. Sonder, who gives the colour of the corolla as pale rose-red, evidently judged from dried specimens.

\* Var.  $\beta$  **micromera** (Sond.) Salter.—*O. minutifolia* Turcz.—*O. ramigera* Sond., var. *micromera* Sond.—*O. gymnoclada* Turcz., var. *micromera* R. Knuth. Plant smaller in all parts. *Leaves* trifoliate. *Corolla* pale lilac, up to 1.5 cm. long, with narrower petals, the claw as long as the lamina. *Ovary* chambers 3 ovuled.

V. R.'s DORP DIV.; Bitterfontein district, *Zey.* 206 (*type* in Herb. Sond.) 204, *S.* 926, 926A, 1579, 3392, 5498, near Klaver, *S.* 1374: NAMAQ., west of Garies, *S.* 6649, 6661, *Caporn* (B.H. 15110). Fl. June—July.

Commoner than the typical form.

\*For notes on this species and its confusion with *O. gracilis* Jacq., see Journ. of S.A. Bot. VI (1940), 121—5.

✱ Var.  $\gamma$  **quinata** Salter, Journ. of S.A. Bot. VI (1940) 123. *Leaflets* 5, linear-cuneate. *Corolla* salmon, with a shorter yellow tube: laminae of the petals broadly obovate or suborbicular, twice as long as the claw. (Plate X (i).)

V.R.'s DORP DIV.; 16 miles west of Bitterfontein, S. 6646 (*type* in Bol. Herb.).

??  
o Var.  $\delta$  **gracillima** Salter, l.c. 123. Plant smaller, more slender, softly and shortly pubescent. *Leaflets* 3, linear or narrow-linear. *Corolla* 1—2.4 cm. long, pale rose, with a subcylindrical yellow tube: laminae of the petals narrow-obovate, as long as the claw. *Ovary* chambers 1—2-ovuled. (Plate X (ii).)

NAMAQ.: Kamieskroon, S. 801 (*type* in Bol. Herb.), between Kamieskroon and Garies, S. 4571, 4574, S.A.M. 48803, Markotter 850.

Dwarfed specimens are very similar in appearance to *O. exserta* Salter, but that species never grows into a tall branching plant and the leaflets have harsher hairs on both faces.

✱ 183. **O. linoides** R. Knuth, Eng. Bot. Jahrb. LXI Beibl. n. 139 (1927) 10. Caulescent. *Stem* branched, pubescent. *Leaves* rather numerous, cauline and apical: petioles 0.5—1.5 cm. long, sparsely pubescent: leaflets 3, sessile, cuneate-oblong, up to 7 mm. long, 2 mm. broad, slightly incised at the apex, glabrous (and pale) above, sparsely pubescent beneath, with several small black calli. *Peduncles* axillary and terminal, up to 3.5 cm. long, pubescent, with 2 alternate bracts near the apex. *Sepals* lanceolate, 5 mm. long, pubescent. *Corolla* 1.6—1.7 cm. long, sparsely pubescent, apparently white.

Locality unknown. *Zeyher*, in Berlin Herb.

The two specimens appear to be of abnormal growth, one at least having been grazed, which has caused the branching. The affinity appears to be with *O. glabra* Th. Not of much scientific value.

✱ 184. **O. albiuscula** Salter, Journ. of S.A. Bot. II (1936) 58. Dwarf, stemless, up to 3 cm. high. *Bulbs* often congested, globose-ovoid, acute at the apex, up to 2 cm. long: outer tunics rough, papery, dark brown, the inner paler, smooth, shining. *Rhizome* slender, 3—10 cm. long. *Leaves* numerous: petioles 1—2 cm. long, slender, adpressed-pubescent: leaflets 3, sessile, linear-oblong, acute at the base and apex, mucronulate, 8—12 mm. long, 1—2.5 mm. broad, subconduplicate or often involute, glabrous above, adpressed-pubescent beneath, densely ciliate with introrse hairs. *Peduncles* 1-flid., numerous (up to 35, but usually only 1—2 flowering at once), more or less as long as the leaves, sparsely pubescent, with 2 alternate ciliate bracts often imbricating the calyx. *Sepals* broadly lanceolate, sometimes shortly attenuate, 4—5 mm. long, reddish, pubescent towards the middle, glabrous towards the margin,

ciliate, ecallose, usually edged with a purple streak. *Corolla* glabrous, 1.6—2.3 cm. long, white, with a funnel-shaped yellow tube: petals cuneate, attenuate to the base, rounded at the apex, 0.7—1 cm. broad, rarely rosy-margined beneath. *Filaments* sparsely glandular-pilose,

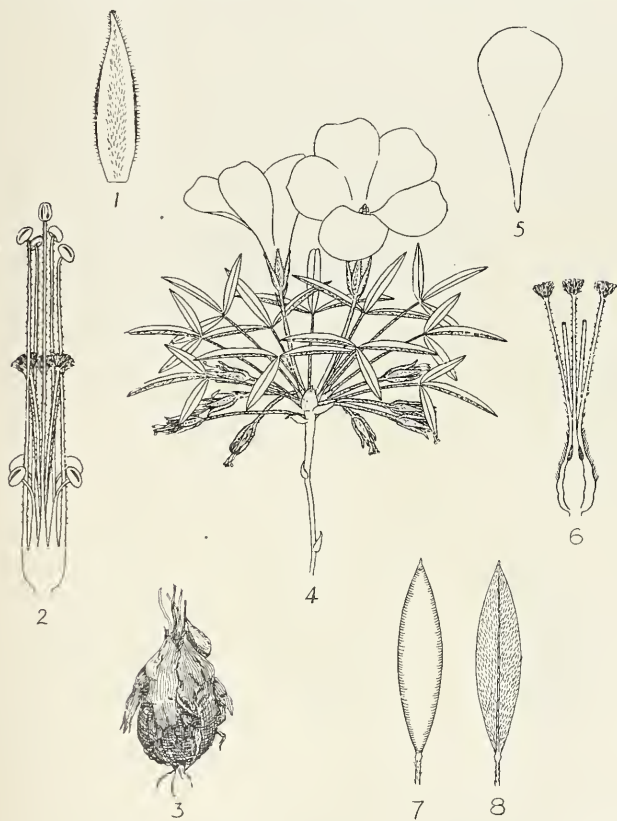


FIG. 65. *Oxalis albiuscula* Salter. 1. Sepal  $\times 6$ . 2. Androecium  $\times 6$ . 3. Bulb, natural size. 4. Plant  $\times 1\frac{1}{2}$ . 5. Petal  $\times 1\frac{1}{2}$ . 6. Gynaecium  $\times 6$ . 7. Medial leaflet, upper side  $\times 3$ . 8. Leaflet, under side  $\times 3$ . (Salter 4608.)

the shorter 3.5—6 mm., the longer 6—10 mm. long, edentate, the longest very unequal. *Ovary* cano-pubescent on the upper half, callose near the apex, the chambers 2—3-ovuled: styles pilose at the base, glandular-pilose above. Seeds without endosperm. (Fig. 65.)

NAMAQ.; open ground 6 miles south of Kamieskroon, *S.* 4608 (type in Bol. Herb.) 5509, 13 miles south of Kamieskroon, *S.* 5572. Fl. June. \*185. *O. kamiesbergensis* Salter, Journ. of S.A. Bot. II (1936) 57. Dwarf, stemless or with a very short stem, rather densely patent-hirtellous, 2—3 cm. high. *Bulb* ovoid, attenuate at the apex, 1.5—2.5 cm. long.

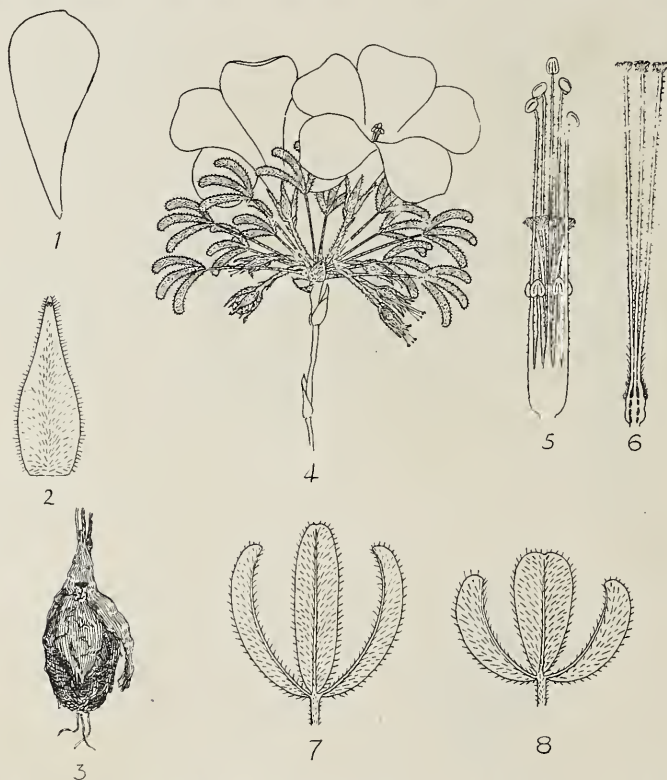


FIG. 66. *Oxalis kamiesbergensis* Salter. 1. Petal  $\times 1\frac{1}{2}$ . 2. Sepal  $\times 6$ . 3. Bulb, natural size. 4. Plant  $\times 1\frac{1}{2}$ . 5. Androecium  $\times 6$ . 6. Gynaecium  $\times 6$ . 7 and 8. Leaflets, under side  $\times 3$ . (Salter 5513.)

tunics rough, brown, papery, acute at the apex. *Rhizome* up to 10 cm. long. *Leaves*: 10—30; petioles about 1 cm. long: leaflets 3, sessile, linear-oblong or cuneate-oblong, conduplicate, falcate, minutely emarginate, 6—9 mm. long, 2—3 mm. broad, glabrous above, pubescent beneath, ciliate, the median nerve conspicuous, with numerous inconspicuous blackish-brown calli. *Peduncles* 1-fld., numerous (living flowers 1—3),

about 5 mm. long, rarely longer, with 2 alternate or subopposite subulate ciliate bracts close to the calyx. *Sepals* lanceolate or ovate-lanceolate, often acuminate, 4—5 mm. long, pubescent, ciliate, inconspicuously bicallose at the apex. *Corolla* glabrous, 1.7—2.2 cm. long, rose, white at the throat, with a funnel-shaped yellow tube: petals cuneate or obliquely cuneate, slightly attenuate at the base, with an obscure point on the rounded apex. *Filaments*, the shorter 3—7 mm., the longer 5.5—11 mm. long, unequal, minutely glandular-pilose, edentate, the longest, like the styles, exerted from the corolla tube. *Ovary* pilose on the upper half, with reddish calli extending to the base between the 3-ovuled chambers: styles pubescent below, glandular-pilose above. *Capsule* globose-ovoid. Seeds without endosperm. (Fig. 66.)

NAMAQ.; Kamiesberg Mts., 6 miles east of Kamieskroon, in open grassy places, *S. 5513* (type in Bol. Herb.), between Garies and Leliefontein, *S. 6677*. Fl. June.

\*186. *O. oligophylla* Salter, Journ. of S.A. Bot. IV (1938) 114. Slender, stemless, almost glabrous, 12—16 cm. high. *Bulb* more or less oval or oblong-oval, often deformed, 1.5—3 cm. long, with hard black gummy tunics. *Rhizome* 2—4 cm. long. *Leaves* 1—2, rarely 3: petioles slender, 6—12 cm. long, purplish and sometimes very sparsely glandular-pilose on the lower part: leaflets 3, sessile narrow-linear, conduplicate, falcate particularly towards the apex, 4—6 cm. long, up to 2 mm. broad. *Peduncles* few, 1-fl., 12—16 cm. long, with 2 minute bracts imbricating the calyx. *Sepals* oblong-lanceolate, 4—5 mm. long, purplish towards the margins, often minutely purple-streaked, sometimes sparsely pubescent, minutely penicillate at the apex, with 2 apical calli. *Corolla* 1.4—1.9 cm. long, white, with a yellowish funnel-shaped tube: laminae of the petals obovate, indistinctly purple-veined, rather longer than the narrow claw. *Filaments*, the shorter 2.5—3.5 mm., the longer 3.5—6 mm. long, minutely glandular-pilose, with subacute teeth. *Ovary* pubescent on the upper half, the chambers 2—3-ovuled: styles rather densely glandular-pilose with simple hairs admixed. (Fig. 67.)

V. R's DORP DIV.; west slope of Gift Berg, about 1800 ft., *S. 7266* (type in Bol. Herb.). Fl. May—June.

All the plants found, though situated on a fairly open hill side, were growing up through small shrublets with only the flowers visible, the leaves being entirely concealed and the rather shallow bulbs well protected from the sun.

#### SUB-SECT. (v) GLANDULOSAE.

Caulescent. Plants densely clothed with capitate (sometimes pluricellular) hairs, often with simple hairs admixed. Leaflets 3. Seeds without endosperm. (Sp. 187—193.)



Not a natural sub-section and only separated from the last on account of the character of the hairs. Many of the species included in this sub-section in Plfrch-Ox. are mere synonyms, while others have been transferred to more appropriate sections.

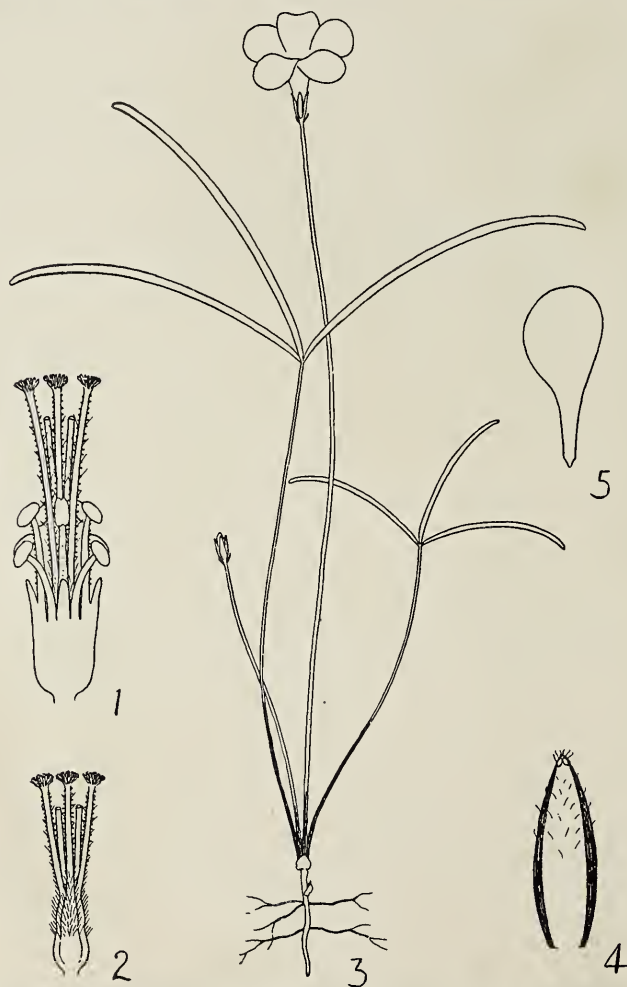


FIG. 67. *Oxalis oligophylla*, Salter. 1. Androecium  $\times 8$ . 2. Gynaecium  $\times 8$ . 3. Plant, natural size. 4. Sepal  $\times 6$ . 5. Petal  $\times 1\frac{1}{2}$ . (Salter 7266.)

187. *O. clavifolia* Sond., Fl. Cap. I (1860) 330. Erect, caulescent, rather weak, 5—20 cm. high, clothed with viscous pluricellular capitate hairs. *Bulb* ovoid, acute at the apex, 1—1.5 cm. long, with thin reddish-brown tunics, *Rhizome* slender, 2—6 cm. long. *Stem* 2—14 cm. long with a few scales at the base, often branching, with several subsessile or shortly petiolate leaves. *Leaves* mostly terminally congested or rarely verticillate on the upper part of the stem: petioles slender, often 1—2 cm. long: leaflets 3, sessile, cuneate or linear-cuneate, dilated at the apex, conduplicate, emarginate, 0.5—1.2 cm. long, glabrous above, the midrib beneath and margins ciliate with pluricellular capitate hairs, ecallose. *Peduncles* rather numerous, 1-fl., terminal on the stem and branches, rarely cauline, usually 2—4 cm. long, with 2 minute bracts on the upper half, or ebracteate. *Sepals* lanceolate, 3—4 mm. long, purplish on the upper part, ecallose. *Corolla* 1.2—1.6 cm. long, glandular, yellow, with a broadly funnel-shaped tube: laminae of the petals obliquely triangular-obovate, about 4 times as long as the attenuate claw, often purple-margined beneath. *Filaments*, the shorter 3—4.5 mm., the longer 4—7 mm. long, minutely glandular-pilose, distinctly gibbose. *Ovary* glandular-pilose on the upper half, ecallose, the chambers 2—3-ovuled. *Capsule* subglobose. Seeds without endosperm.

V. R.'s DORP DIV.; Knackisberg, Zey. (type), Eenkoker, Zey. 48, near Bitterfontein, S. 927, 5347, 6645: NAMAQ.: near Kamieskroon, S. 4609, 5573, near Garies, S. 2531. Fl. May—July.

Some confusion has arisen over this species owing to a misstatement as to the colour of the corolla (i.e., "with a violet limb") in Sonder's description. Both Zeyher's collectings are in Sonder's Herbarium at Stockholm and are named in his own handwriting. The corolla is unmistakably yellow.

188. *O. deserticola* Salter, Journ. of S.A. Bot. I (1935) 115. Erect, caulescent, 5—18 cm. high, densely clothed with patent hyaline pluricellular capitate hairs. *Bulb* oblong-lanceolate in outline about 8 cm. long, tortuous: tunics ligulate, many-nerved and conspicuously longitudinally ridged, the outer at length splitting and fibrous. *Stem* up to 10 cm. long, with a few semiamplexicaul scales. *Leaves* up to 18, apically congested, with petioles 1—2.5 cm. long: leaflets 3, sessile, linear-cuneate, conduplicate, slightly emarginate, 0.7—1.6 cm. long, 1—3.5 mm. broad, more or less falcate towards the apex, usually with a number of inconspicuous brown apical calli, ciliate, glabrous and often glaucous above, pilose beneath, particularly on the lower part and median nerve. *Peduncles* 1-fl., terminal, rarely arising from the cauline scales, 0.5—2 cm. long, rather shorter than the leaves, with 2 alternate filiform bracts towards the apex. *Sepals* lanceolate, attenuate, acute, 5—7 mm. long,

often with purple streaks along the margins. *Corolla* 1.5—2.4 cm. long, white, the short broadly funnel-shaped yellow tube often longi-

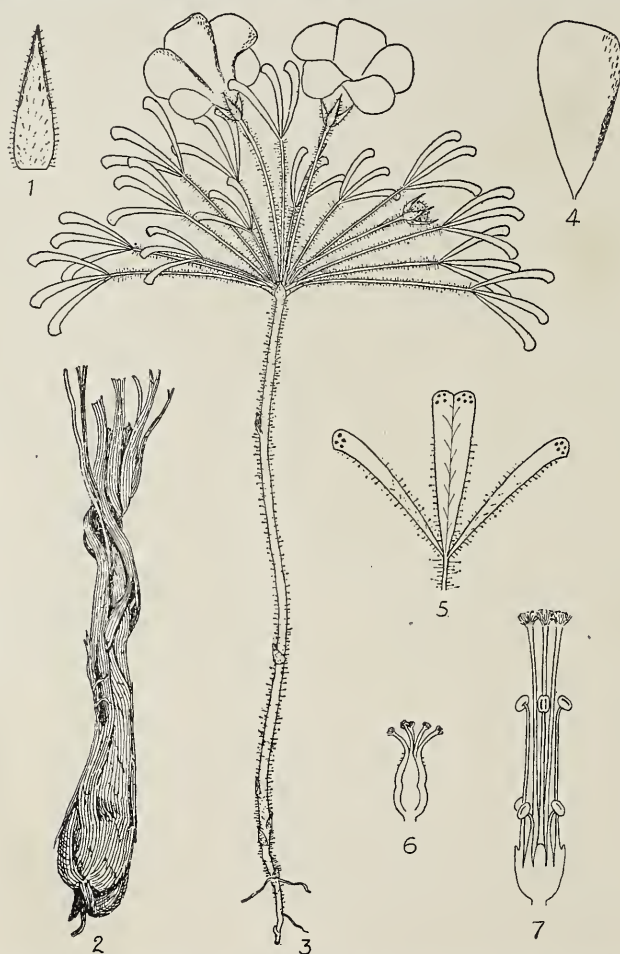


FIG. 68. *Oxalis deserticola* Salter. 1. Sepal  $\times 4$ . 2. Bulb, natural size. 3. Plant, natural size. 4. Petal  $\times 1\frac{1}{2}$ . 5. Leaf, showing upper side of medial leaflet  $\times 2$ . 6. Gynaecium  $\times 6$ . 7. Androecium  $\times 6$ . (Salter 711.)

tudinally streaked with 5 purple lines : petals cuneate, sometimes slightly attenuate to the base, obliquely subtruncate at the apex, more or less

streaked with purple on the outer margin beneath. *Filaments* glabrous, the shorter 2—4 mm., the longer 4—7.5 mm. long, shortly and obtusely toothed. *Ovary* glabrous or sparsely glandular-pilose above, the chambers 2—3-ovuled. *Capsule* globose. Seeds without endosperm. (Fig. 68.)

V. R's DORP DIV. ; 16 miles north east of Van R's Dorp, *Pillans* 6634, *S. 711* (type in Bol. Herb.), 2493, 5321. Fl. May—July.

Apparently very local, growing on one small stony kopje in association with *O. melanograpta* Salter.

✱ 189. *O. droseroides* E. Mey. ex Sond., Fl. Cap. I (1860) 330.—*O. semiglandulosa* Sond.—*O. saronensis* Bolus f.—*O. saronensis* R. Knuth. erect, caulescent, often caespitose, 7—15 cm. high, usually densely clothed with both simple and pluricellular or bicellular viscous capitate hairs. *Bulb*, when mature, ovoid, attenuate-acute at the apex, up to 7 cm. long, the younger often lanceolate in outline: tunics broadly lanceolate, sharply pointed, brown, shining, splitting at the base. *Rhizome* 10—15 cm. long. *Stem* 4—10 cm. long, with a few amplexicaul scales and often with a few subsessile leaves on the upper part. *Leaves* terminally congested, the outer petioles short, squamiform, the inner slender up to 2 cm. long: leaflets 3, almost sessile, linear, linear-cuneate, oblong-cuneate or oblong-oval, slightly emarginate, often conduplicate, 6—9 mm. long, glabrous above, adpressed-pubescent beneath, with capitate hairs on the midrib and margins, bicallose at the apex, minutely black-dotted. *Peduncles* 1-flid., terminal, 2—4 cm. long, with 2 alternate linear bracts a little below the calyx. *Sepals* lanceolate, 4—5 mm. long, inconspicuously bicallose at the apex, often purple-margined. *Corolla* 1.5—2.5 cm. long, deep rose, the narrowly funnel-shaped yellow tube with pluricellular hairs: laminae of the petals obovate, purple on the lower margin beneath, slightly shorter than the narrow-cuneate claw. *Filaments* glabrous or sparsely glandular-pilose, the longer 4—8 mm. long, with longish narrow teeth. *Ovary* usually pilose on the upper half, the chambers 1-ovuled. Seeds without endosperm.

TULBAGH DIV. ; *Drège*, hills in rhinosterbos, Zwartland (type), *Drège*, Zwartland, between Postelyn Berg and Berg River, Saron *Schltr.* 7858 (*O. saronensis* Bolus f.), *Schltr.* 7859 ex pte.,\* (*O. saronensis* R. Knuth). *S. 2169*, 5265: WORCES. DIV. : Bain's Kloof, *S. 5260*, Hex River ?, *Zey.* 249,† 254 (*O. semiglandulosa* Sond). Fl. May.

I have no hesitation in bringing all these species together under one head without varieties. All the *Drège* specimens of *O. droseroides* which

\*R. Knuth in Pfärrch-Ox. cites *Schltr.* 7859 (ex pte.) as his type of *O. saronensis*, but it is evident that the Berlin set of *Schltr.* 7858 has been mixed in distribution with 7859 (*O. Urbaniana* Schltr.), a very similar species from the same locality. Bolus f. had earlier given *Schltr.* 7858 the name *saronensis*.

†See Introduction, Part III, Errors in Zeyher's localities.

I have seen, including those in Sonder's herbarium, are very poor material. On close examination I find that they bear a few simple as well as gland-tipped hairs.

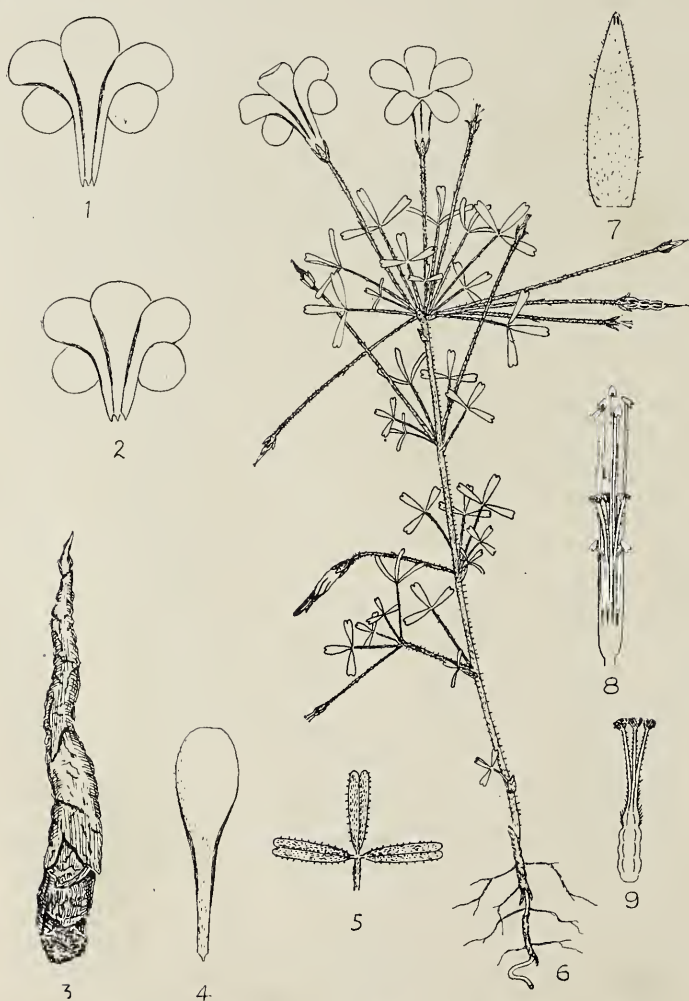


FIG. 69. *Oxalis suteroides* Salter. 1. Corolla  $\times 1\frac{1}{2}$ . 2. Corolla of var.  $\beta$   $\times 1\frac{1}{2}$ . 3. Bulb, natural size. 4. Petal  $\times 2$ . 5. Leaf, underside  $\times 2$ . 6. Plant, natural size. 7. Sepal  $\times 10$ . 8. Androecium  $\times 6$ . 9. Gynaecium  $\times 6$ . (Salter 700.)



Sonder's distinction of this species from *O. semiglandulosa* by the *bell-shaped* and *tubular* corolla respectively is quite inexplicable for the shape of even the tube cannot be made out from these old specimens. In actual fact the corolla is exactly the same shape in both.

\*190. *O. suteroides* Salter, Journ. of S.A. Bot. I (1935) 116. Erect, caulescent, up to 25 cm. high, more or less clothed with both simple and admixed pluricellular capitate hairs. *Bulb* elongate, tapering to the acute apex, often tortuous, up to 7 cm. long: tunics thin, brown, undulate. *Rhizome* coated with a papery brown cortex. *Stem* rigid, up to 1 mm. thick, often branched, like the rhizome bearing amplexicaul cuspidate scales. *Leaves* fairly numerous, apically congested on the stem and branches, rarely cauline, with very slender petioles up to 1.5 cm. long: leaflets 3, shortly petiolulate, linear-cuneate or oblong-cuneate, sometimes conduplicate-falcate, emarginate, 5—7 mm. long, 1—2 mm. broad, glabrous above, with a few capitate hairs on the margins and median nerve. *Peduncles* 1-fl'd., often numerous, terminal, rarely axillary in the cauline scales, longer than the leaves, up to 3.5 cm. long, with 1—2 linear alternate bracts, 1—1.5 mm. long, at the middle or on the upper half. *Sepals* lanceolate, 2.5—3 mm. long, sometimes blackish at the apex, with 2 small apical calli. *Corolla* up to 1.8 cm. long, pale violaceous, shortly glandular-pubescent: tube narrowly funnel-shaped, yellow, with 5 narrow dark-violet lines on the upper part: laminae of the petals narrow-obovate, sub-truncate, 4.5—6 mm. broad, violet-veined, yellowish on the outer margin beneath, about as long as the narrow claw. *Filaments*, the shorter 3—5 mm., the longer 4.5—7 mm. long, glabrous or very sparsely glandular-pilose, edentate, with subsagittate anthers. *Ovary* oblong, 2.5 mm. long, pubescent at the apex, the chambers 3—4-ovuled: styles pubescent below, minutely glandular-pilose above. *Capsule* elongate, about 1 cm. long, streaked with 5 purple lines, exserted beyond the calyx. Seeds without endosperm. (Fig. 69.)

V. R's DORP DIV.; on south slopes of Van Rhyn's Pass, *S.* 700 (type in Bol. Herb.), Pillans 6639, between V. R's Dorp and the Pass, *S.* 2500, 4479. Fl. May—June.

\*Var. *β latituba* Salter, l.c. 118. *Sepals* ovate-lanceolate. *Corolla* shorter, pale milky-white, with a more broadly funnel-shaped tube petals subacute at the apex, scarcely attenuate below. *Ovary* densely pubescent.

CALVINIA DIV.; about Nieuwoudtville, *S.* 4475 (type in Bol. Herb.) 1649B, 4556, 7326, Karamoe, *S.* 5401.

191. *O. ebracteata* Savign., Lam. Encycl. IV (1897) 682.—*O. aganophylla* E. & Z. Caulescent, slender, erect, 8—30 cm. high, clothed with both short simple and longer pluricellular capitate hairs. *Bulb* ovoid,

acute at the apex, 1.2—2 cm. long, with rather thin brown tunics. *Rhizome* slender, up to 12 cm. long. *Stem* slender, rarely branched, leafy, particularly on the upper part, in the taller plants usually almost naked below, with a few scales towards the base. *Leaves* cauline, the topmost often somewhat congested: lower petioles very short, squamiform, the upper often 1 cm. long, slender terete: leaflets 3, shortly petiolulate, obcordate, cuneate-obcordate or cuneate-oblong, 3—9 mm. long, thin, glabrous above, pilose beneath, ciliate. *Peduncles* 1-fl., rather numerous, in the leaf-axils on the upper half of the stem, 3—9 cm. long, ebracteate. *Sepals* lanceolate or ovate-lanceolate, 3—5 mm. long. *Corolla* 1.5—2.5 cm. long, sparsely glandular-puberulous, pale violet or white, with a narrowly funnel-shaped yellow tube: petals broadly spathulate or with the laminae narrow-obovate, about as long as the tapering claw. *Filaments* glabrous, the shorter 3—5.5 mm., the longer 5—9 mm. long, with narrow teeth: anthers small, somewhat triangular. *Ovary* glabrous or pubescent at the apex, the chambers 1-ovuled: styles pubescent below, glandular-pilose above. Seeds without endosperm.

CLANW. DIV.; *E. & Z.* 672 (*O. aganophylla* E. & Z.), *Edwards* 218, *B.H.* 14613, 19780, 19669, 19670, 19762, *Pillans* 6656, 6657, *S.* 383/12, *S.* 732, 733, 742, 1682, 5295, 8146: PTQBG. DIV.; *Drège* 5251 (*O. laxa* E. Mey.), *Zey.* 222, *Schltr.* 7857, 7858 (ex pte.) *S.* 8158: TULBAGH DIV.; *S.* 2098, 2174, 2277, 6090. Usually in partial shade. Fl. Apl.—June.

*Drège* 5251 has previously been erroneously cited as *O. bifurca* Lodd., an Eastern species, perhaps through interchange of tickets. The *type* is *le Vaillant* in Herb. Lam.

★ 192. *O. neglecta* R. Knuth, Engl. Bot. Jahrb. LXI, Beibl. n. 139 (1927) 11. Caulescent, 5 cm. high. *Bulb* ovoid, beaked, about 1.5 cm. long, 1 cm. in diam., with soft brown tunics. *Rhizome* 2.5 cm. long, coated with a brown cortex. *Stem* slender, 3 cm. long, densely glandular-pilose. *Leaves* 2—3 cauline, 4 terminal, glandular-pilose: petiole as long as the leaflets: leaflets 3, sessile, linear, 2.5—3 mm. long, 1 mm. broad, conduplicate. *Peduncles* terminal, about 3 times as long as the leaves, ebracteate, glandular-pilose. *Sepals* more or less lanceolate, about 3 mm. long. *Corolla* 1.5 cm. long, glandular, white, with a funnel-shaped tube.

CALVINIA DIV.; Hantam Gebirge, *Meyer*, anno 1869 (*type*, Berlin).

The sole specimen is evidently much starved. It seems to be scarcely separable from *O. ebracteata* Savign. Little seems to be gained from creating species from such fragmentary material.

17 193. *O. tenuis* Salter, Journ. of S.A. Bot. IV (1938) 118. Slender, caulescent, 7—10 cm. high, pubescent and, except on the leaflets, with capitate and often pluricellular hairs admixed. *Bulb* ovoid, acute at the

apex, 1.5—2 cm. long, with rather hard blackish-brown tunics. *Rhizome* slender, about 2—4 cm. long. *Stem* erect, 4—7 cm. long, rarely branching, with 1—2 scales or leaves. *Leaves* 6—10, apically congested, often one cauline, with filiform petioles 0.8—1.4 cm. long: leaflets 3, sessile, narrow-linear, conduplicate, slightly falcate, emarginate, 1—1.5 cm. long, 1—1.5 mm. broad, glabrous or sparsely pubescent beneath. *Peduncles* 1-fl., terminal, 1.5—2.5 cm. long, with 2 minute bracts or bracteate. *Sepals* lanceolate, 2.5—3 mm. long, ciliate, darkening towards the apex, ecallose. *Corolla* 1.4—1.7 cm. long, white, glandular, with a rather widely funnel-shaped dull yellow tube: petals subcuneate, 6—8 mm. broad, slightly attenuate below, rounded above. *Filaments*, the shorter 2—3 mm., the longer 3—5.5 mm. long, glandular-pilose, with obtuse teeth about 0.5 mm. long. *Ovary* scarcely 1 mm. long, pubescent on the upper half, ecallose, the chambers 1-ovuled: styles pubescent below, glandular-pilose above. Seeds endospermous.

V. R's DORP DIV.; in shade of bushes on western slope of Gift Berg, S. 7260 (type in Bol. Herb.). Fl. May—June.

FORM B. *Ovary* chambers 2—3-ovuled. *Capsule* up to 6 mm. long, exserted beyond the calyx.

V. R's DORP DIV.; Gift Berg, *Leipoldt* (B.H. 22670). Fl. July.

#### SUB-SECT. (vi) MULTIFOLIOLATAE.

Leaflets normally more than 3 (except in *O. variifolia* Steud., var. *ternata*). Caulescent or stemless plants, sometimes with capitate hairs. Seeds without endosperm.

An artificial sub-section consisting of multifoliolate species which do not appear to be related elsewhere. Since the number of leaflets varies in many species, several of those with trifoliolate leaves having multifoliolate varieties, this character has no bearing on their actual affinity. The majority of the species included in the § Multifoliolatae in Pfirch-Ox. have been transferred to more appropriate sections, but all plants with more than three leaflets can be traced in Group 24 of the Analysis of the Species.

Caulescent .. .. .	Sp. 194—198
Stemless .. .. .	Sp. 199—200

\*194. *O. Engleriana* Schltr., Eng. Bot. Jahrb. XXIV (1898) 438.—*O. Guthriei* Bolus f. Erect, caulescent, slender, 8—18 cm. high, pubescent either with simple or simple and capitate hairs admixed. *Bulb* ovoid or oblong-ovoid, attenuate at the apex, up to 6 cm. long, with brown splitting tunics. *Rhizome* 8—10 cm. long, clothed, at least below, with a tunicaceous cortex. *Stem* wiry, rarely branched, 5—15 cm. long, rather

densely pubescent below, sparsely pubescent or glabrous above, with 1—4 scales or more rarely subsessile leaves. *Leaves* terminally congested : petioles filiform 0.5—1.5 cm. long : leaflets 5—8, sessile, linear or linear-oblong, obtuse, minutely emarginate, conduplicate or involute, 4—10 mm. long, much enlarged after the flowering period, glabrous above, pilose beneath, ciliate, with several small brown calli on the upper part. *Peduncles* 1-fl., slender, terminal or very rarely arising from a stem-scale, rarely exceeding the leaves, with 2 alternate subulate bracts on the upper part. *Sepals* lanceolate, 4—5 mm. long, sometimes purple-margined. *Corolla* 1.5—2 cm. long, pubescent or glandular-pubescent, rose or violaceous, with a rather narrowly funnel-shaped yellow tube : laminae of the petals broadly and obliquely obovate, 6.5—10 mm. broad, greenish-buff or purple on the outer margin beneath, about as long as the narrow claw. *Filaments*, the shorter 2.5—5 mm., the longer 5—7.5 mm. long, sparsely glandular-pilose, gibbose or shortly toothed. *Ovary* pubescent on the upper part, the chambers 2-ovuled : styles pubescent below, with pluricellular hairs above. *Capsule* subglobose. Seeds without endosperm.

CALEDON DIV. ; near Caledon Schltr. 7755, not 7955 (type), *Guthrie* 4157 (*O. Guthriei* Bolus f.), *B.H.* 14779, 18609, *S.* 604, 1219, 2300, 2304, 3314, 6033, 6036, 7213, 7217 : WORCES. DIV. ; near Stettyn, *S.* 2312 : ROBERTSON DIV. ; *B.H.* 22601. Fl. May—June.

*O. Guthriei* Bolus f. cannot be upheld as a species or even a variety. The prevalence of gland-tipped hairs is variable on different specimens and plants with or without them are often found growing in association, nor is there any real difference in the size of the corolla. Plants with long lax stems are occasionally found growing up amongst and supported by surrounding vegetation. It is not unlike *O. duriuscula* Schltr. in habit and although the bracts on the peduncle are alternate, it is possibly an affinity.

\* 195. *O. Henrici* Bolus f., *Ann. of Bol. Herb.* II, Pt. I (1918) 24. Very slender, caulescent, 6—10 cm. high, puberulous, with gland-tipped hairs admixed. *Bulb* ovoid, attenuate at the apex, about 1.5 cm. long, with thinnish undulate chestnut-coloured tunics. *Rhizome* about 1—2 cm. long, with a few small amplexicaul scales. *Stem* erect, 2—8 cm. long, with a few scales or abortive leaves. *Leaves* few, 3—5-foliolate, congested at the apex of the stem, sometimes 1—2 cauline, with petioles up to 1 cm. long : leaflets linear, obtuse, slightly attenuate towards the base, emarginate, conduplicate, up to 3 mm. long, puberulous beneath, with several reddish calli towards the apex and margins. *Peduncles* 1-fl., axillary in the stem-scales, 3—8 cm. long, with 2 small alternate (?) linear bracts on the upper part. *Sepals* ovate-lanceolate, attenuate at the apex, about 3 mm. long, puberulous, ciliate, sometimes narrowly



purple-margined. *Corolla* 1.5—2 cm. long, glabrous, reddish, with a rather narrow yellow tube. *Filaments* glabrous, the longest 7 mm. long, edentate. *Ovary* scarcely 2 mm. long, pilose towards the apex.

WORCES. DIV.; near De Doorns, *Bolus* 13079 (*type* in Bol. Herb.).

Only known to me from the type specimens which appear to be starved, and the leaves are obviously undeveloped. It appears to be related to the foregoing species, but it is impossible to judge with any certainty from such poor material.

\* 196. *O. Zeyheri* Sond., Fl. Cap. I (1860) 347.—*O. hantamensis* Schltr. ex R. Knuth. Rather small, with a more or less exerted stem, clothed with both simple adpressed pubescence and with admixed patent pluricellular hairs. *Bulb* oblong-lanceolate in outline, about 4 cm. long, with vertically grooved brown tunics. *Rhizome* often 8—12 cm. long. *Stem* scarcely exerted or up to 3 cm. long, rather densely pilose, with a few ovate-lanceolate scales. *Leaves* closely imbricate at the apex of the stem, with rather slender petioles up to 3 cm. long: leaflets 7—15, sessile, linear or linear-cuneate, conduplicate-falcate, minutely emarginate, 2—9 mm. long, glabrous above, pubescent beneath, with capitate hairs on the margins and midrib and with several inconspicuous brownish calli towards the apex. *Peduncles* 1-fl., terminal or rarely arising from the upper stem-scales, longer than the leaves, with 2 alternate linear bracts, often 2 mm. long, on the upper part. *Sepals* lanceolate, 4—4.5 mm. long, often purple-margined. *Corolla* 1.6—2.2 cm. long, sparsely pubescent, rosy or violaceous, the very narrowly funnel-shaped or cylindrical tube marked with 5 narrow vertical streaks. *Filaments*, the longer up to 7 mm. long, sparsely glandular-pilose on the outer edge, slightly gibbose. *Ovary* pubescent on the upper half, the chambers 2-ovuled: styles pubescent below, sparsely glandular-pilose above.

WORCES. DIV.; at Berg (probably an error for Hex) River, *Zey.* 248 (ex pte., *type* in Herb. Sond.), De Doorns *S.* 2191, and cult.: LAINGSBURG DIV.; Tweedside, *S.* 2205: MONTAGU; *S.* 3114: CERES DIV.; *S.* 2644: CALVINIA DIV.; Hantam Gebirge, *Meyer* (*O. hantamensis* R. Knuth) *S.* 3489. Fl. Apl.—May.

There has been a great deal of confusion over this species, firstly on account of Sonder's failure to notice and mention the capitate hairs (admittedly very inconspicuous) on the starved specimens *Zey.* 248 and the absence of the rather exceptional bulb: secondly through the misleading and probably erroneous locality given.\*

In many herbaria a species (*O. amblyodonta* Salter) which grows in the neighbourhood of Great and Little Berg Rivers (Tulbagh and Piquet-

\*See Introduction, Part III, Errors in Zeyher's localities.



berg Divs.) has, through Schlechter's misidentification, been mistaken for *O. Zeyheri* and, indeed, R. Knuth, who had not seen the *type*, went so far as to re-describe *O. Zeyheri* in Pflrch-Ox., p. 380, from *Schltr.* 7841,

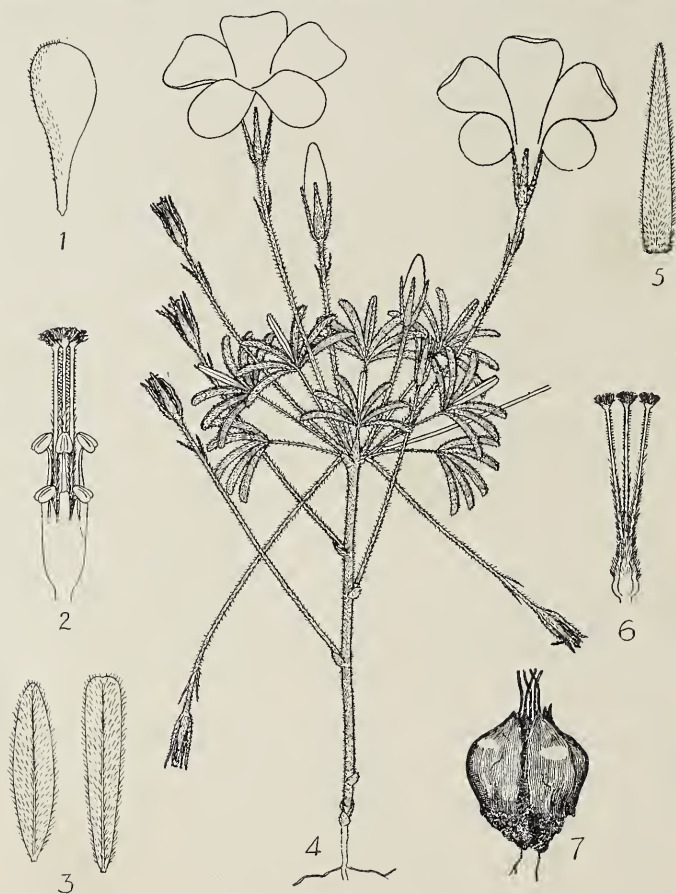


FIG. 70. *Oxalis amblyodonta*, Salter. 1. Petal, natural size. 2. Androecium  $\times 5$ . 3. Leaflets, under side  $\times 3$ . 4. Plant, natural size. 5. Sepal  $\times 3$ . 6. Gynaecium, medio-stylar form  $\times 5$ . 7. Bulb, natural size. (Salter 2279.)

which is, in fact, *O. amblyodonta*, and also described Meyer, Hantam Gebirge, which is *O. Zeyheri*, as a new species, *O. hantamensis*.

In starved specimens the flowers often appear before the leaves are fully developed.

197. *O. amblyodonta* Salter, Jour<sup>n</sup>. of S.A. Bot. II (1936) 159. Robust, caulescent, up to 14 cm. high, rather densely and coarsely pubescent. *Bulb* subglobose or ovoid, often 2 cm. long, with hard blackish-brown tunics. *Stem* up to 5 cm. long, densely hairy, with a few brown scales. *Leaves* 8—20, terminally congested: petioles up to 3 cm. long, the outer shorter, often squamiform: leaflets 5—7, sessile, narrow-oblong or linear, usually conduplicate-falcate, obtuse, minutely emarginate or subacute, 0.6—1.1 cm. long, 1.5—2 mm. broad, glabrous above, villosa-pubescent beneath, ciliate. *Peduncles* 1-fl., rather numerous, terminal or 1—3 arising from the stem-scales, with 2 alternate linear pilose bracts near the calyx. *Sepals* linear-lanceolate, 8—9 mm. long, hairy, ciliate, ecallose. *Corolla* lilaceous, 2.2—2.8 cm. long, with a narrowly funnel-shaped yellow tube: laminac of the petals obliquely obovate a little longer than the claw, up to 1 cm. broad, pubescent and faintly purple on the outer margin beneath. *Filaments* glabrous, the shorter 2.7—4 mm., the longer 4.5—9 mm. long, the teeth broad, irregularly truncate. *Ovary* densely cano-pilose on the upper half, ecallose, the chambers 2—3-ovuled: styles cano-pubescent below, glandular-pilose above. Seeds without endosperm. (Fig. 70.)

TULBAGH DIV.; Bushman's Kop, near Gouda, S. 2279 (type in Bol. Herb.), 6091, *Schltr.* 7941: CLANW. DIV.; *Edwards* (B.H. 21746): Loc. ? B.H. 19733, 19753. Fl. May—July.

FORM B. *Leaflets* 7—10, usually 9, linear, 1.3—1.5 cm. long, about 1 mm. broad, conspicuously emarginate. *Sepals* narrower 1.1—1.2 cm. long. *Corolla* 2.9—3.2 cm. long, with a narrower tube.

PIQBG. DIV.; near Porterville, S. 2612; CLANW. DIV.; *Leipoldt* (B.H. 19766), Brackfontein, *Schltr.* 7973 (ex pte.).

This species has been confused with both *O. Zeyheri* Sond. and *O. variifolia* Steud.

198. *O. variifolia* Steud. Nom. Ed. II (1841) 242.—*O. pentaphylloides* Sond.—*O. stenodactyla* Turcz.—*O. heterophylla* E. & Z.—*O. pentaphylloides* Sond., var. *glabriuscula* Sond. Erect, 7—12 cm. high, more or less pubescent, the stem shortly exserted. *Bulb* acute at the apex, with dark brown, sometimes gummy tunics. *Rhizome* 10 cm. long or more. *Stem* 1—3 cm. long, pubescent or rarely glabrous, with 1—2 broadly ovate scales. *Leaves* 4—16, terminally congested, 5-foliolate, or a few of the outer 3—4-foliolate: petioles pubescent, 1.5—3 cm. long, the outer often shorter; leaflets sessile, narrow-linear, conduplicate or involute, slightly falcate, minutely emarginate, 1—1.5 cm. long, usually pubescent beneath, ecallose. *Peduncles* 1-fl., subterminal, arising below or outside the leaves and about twice their length, stouter than the petioles, pubescent particularly on the upper part, with 2 alternate subulate bracts

above the middle or near the calyx. *Sepals* lanceolate or linear-lanceolate, slightly attenuate 4—6 mm. long, pubescent, ciliate, ecallose. *Corolla* 2—2.8 cm. long, white or lilaceous, with a funnel-shaped yellow tube: laminae of the petals obovate or oblong-obovate, rather longer than the

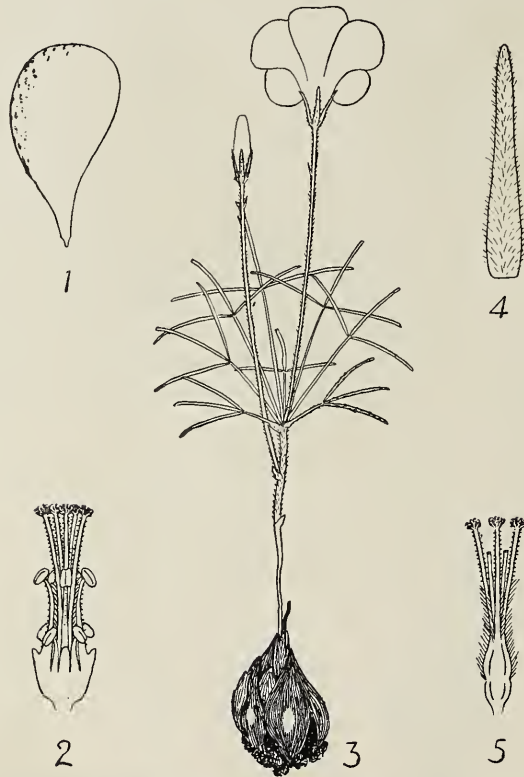


FIG. 71. *Oxalis variifolia* Steud., var. *ternata* Salter. 1. Petal  $\times 1\frac{1}{2}$ . 2. Androecium  $\times 6$ . 3. Plant, natural size. 4. Sepal  $\times 5$ . 5. Gynaecium  $\times 6$ . (Salter 5620.)

claw. *Filaments*, the shorter 2—3 mm., the longer 3—6 mm. long, glandular-pilose, toothed. *Ovary* densely pubescent on the upper half, ecallose, the chambers 2—3-ovuled: styles pubescent, with gland-tipped hairs admixed on the upper half.

CLANW. DIV.; Brackfontein, E. & Z. 744 (*O. heterophylla* E. & Z.

non D.C., *type*), *Schltr.* 7973 (pars. 5-foliolata), *S.* 757 : PIQBG. DIV. between Pools and "The Rest", *Pillans* 6648, *S.* 665 : MALMESB. DIV. ; between Postelyn Berg and Berg River, *Drège* (var. *glabriuscula* Sond.). Fl. May.

\* Var.  $\beta$  *ternata* Salter, Journ. of S.A. Bot. VI (1940) 173. *Leaves* 3-foliolate. (Fig. 71.)

PIQBG. DIV. ; 1 mile north of Piquetberg, *S.* 5620 (*type* in Bol. Herb.), 5285, *Schltr.* 7918 (cited in Pfrsch-Ox. as *O. leptocalyx*). Fl. July.

Some sets of *Schltr.* 7973 consist of two species. Only those with 5-foliolate leaves are *O. variifolia*, those with multifoliolate leaves, rather more robust plants, are *O. amblyodonta* Salter. The species varies considerably in the degree of pubescence and Sonder's var. *glabriuscula* cannot be upheld.

Var.  $\beta$  is very similar to the forms of *O. polyphylla* Jacq., var. *pubescens* Sond. which are without apical calli on the leaflets, but it differs in having smooth bulb-tunics, more slender attenuate ecallose sepals, broader petals and 2—3-ovuled ovary-chambers. *Schltr.* 7918, labelled *O. leptocalyx* and accepted as such in Pfrsch-Ox., the author not having seen the *type*, should be placed here.

\* 199. *O. palmifrons* Salter, Journ. of S.A. Bot. II (1936) 161. Stemless, up to 4 cm. high. *Bulb* ovoid, often 4 cm. long ; tunics rather hard, loosely imbricate, attenuate-acicular at the apex, dark brown, minutely rough and undulate. *Rhizome* up to 25 cm. long, thick in the upper part. *Leaves* rosulate, prostrate, usually very numerous : petioles compressed, up to 2 cm. long and 2.3 mm. broad, winged below the basal articulation, elongating after flowering, glabrous above, pubescent beneath, densely ciliate : leaflets 20—29, sessile, palmate, oblong, completely conduplicate-involute and so subcylindrical, 5—7 mm. long, glabrous above (i.e. inside), pubescent beneath, minutely penicillate at the apex, the incurved ciliation concealed within. *Peduncle* solitary, 1-flid., 0.5—1.5 cm. long, sparsely hairy, with 2 keeled pubescent bracts imbricating the calyx. *Sepals* ovate-lanceolate, often slightly attenuate, about 6 mm. long, pilose and ciliate with hyaline hairs, particularly on the upper part. *Corolla* 2—3 cm. long, white, with a funnel-shaped yellow tube : laminae of the petals broadly obovate, up to 1.3 cm. broad, obscurely darkened on the outer margin beneath, a little longer than the obliquely tapering claw. *Filaments*, the shorter 2.5—5 mm., the longer 5.5—7.5 mm. long, sparsely and minutely glandular-pilose, with very broad truncate teeth. *Ovary* pubescent on the upper half, ecallose, the chambers 2—3-ovuled : styles pubescent below, glandular-pilose above. (Fig. 72.)

LAINGSBURG DIV. ; Tweedside, *S.* 6053 (*type* in Bol. Herb.), *Compton*

3992 (cult.), 6350 : CERES DIV. ; Wolverivier, S. 6063 : SUTHERLAND DIV. ; Uitkyk, Marl. 7937 (leaves only). Fl. May—June.

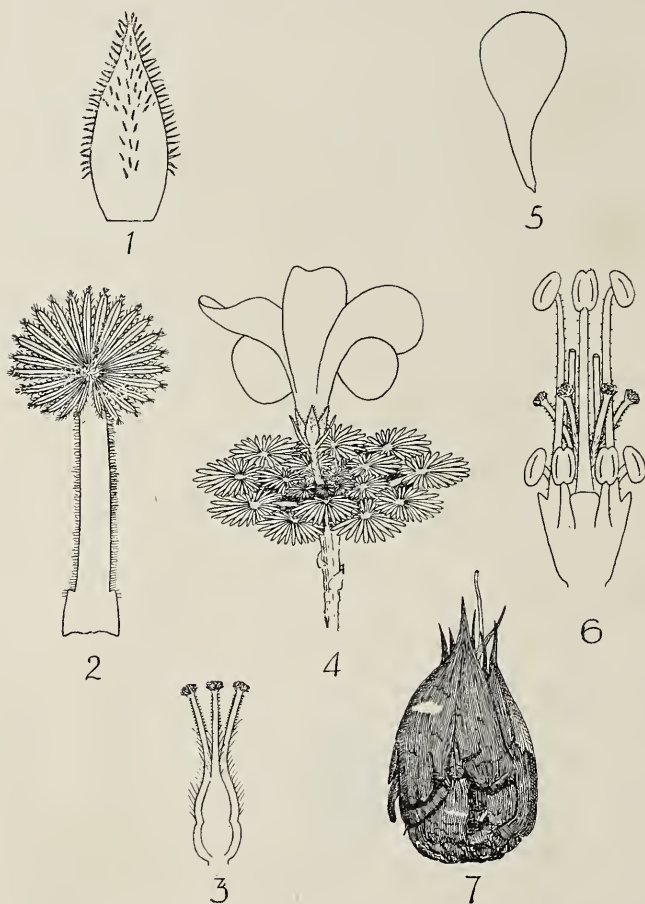


FIG. 72. *Oxalis palmifrons*, Salter. 1. Sepal  $\times 5$ . 2. Leaf, upper side  $\times 2$ . 3. Gynaecium  $\times 6$ . 4. Plant, natural size. 5. Petal, natural size. 6. Androecium  $\times 6$ . 7. Bulb, natural size. (Salter 6053.)

The bulbs lie at a depth of about 10 inches in hard clayey soil, usually embedded among stones and are often flattened and deformed. It seems to flower somewhat rarely and the flowers generally appear before the



leaves have developed. At a later stage the petioles lengthen considerably and in some specimens the rosette of leaves is 12 cm. in diam. Dr. Marloth has noted that it has the local name "Sopzuring", used for soup.

It has no near affinity.

✓ 200. *O. tomentosa* L. f. Supp. (1781) 244. Stemless or with the stem shortly exerted, 6—12 cm. high, densely silky-villous. *Bulb* oblong-ovoid, 1.5—2 cm. long, the acute apical point often curved: tunic, greyish-brown. *Rhizome* usually 15 cm. long or more, rather thick pilose, often enclosed in a tunicaceous cortex. *Stem* not exerted or more rarely up to 2 cm. long, densely pilose, with several large ovate pilose scales. *Leaves* 5—15, subrosulate, increasing greatly in size after flowering: petioles up to 5 cm. long, with patent hairs: leaflets 10—20, peltately spreading, oblong-cuneate, 0.6—1.6 cm. long, often conduplicate, minutely emarginate, rather densely adpresso-pilose on both faces, ciliate with both erecto-patent and introrse hairs. *Peduncles* 1-flid., stout, as long or twice as long as the leaves, pilose with spreading hairs, with 2 linear pilose bracts imbricating the calyx. *Sepals* lanceolate, 5—7 mm. long, densely silky-pubescent. *Corolla* 2.5—3.3 cm. long, white, with a rather narrowly funnel-shaped pubescent yellow tube: laminae of the petals broadly cuneate-ovovate, pubescent along the outer margin beneath, slightly longer than the claw. *Filaments*, the shorter 3—4.5 mm., the longer 4.5—7 mm. long, minutely glandular-pilose, with short broad obtuse teeth. *Ovary* densely pubescent on the upper half, ecallose, the chambers 1-ovuled: styles pubescent, with some capitate hairs above. Seeds without endosperm.

CAPE PENIN.; *Bolus* 3390, *W-Dod* 1063, *Schltr.* 809, *Pillans* 2502, *S.* 245/16, 508, 8087: CAPE DIV.; *S.A.M.* 48357: PAARL DIV.; *S.* 6000: WELLINGTON DIV.; *S.* 4498: MALMESB. DIV.; *E. & Z.* 750, *B.H.* 14558, *S.* 2164: TULBAGH DIV.; *Schltr.* 7852: CLANW. DIV. ?; *Zey.* 227, *Burke & Zey.* 244,\* Wolverivier, Ceres Div., is almost certainly an error in locality. Fl. Apl.—June.

Common in the Divisions neighbouring on Cape Town and often flowering before the full development of the leaves. The indument can scarcely be described as "tomentose". The young bulbs produce the same specialised root as the species in the § *Crassulae*.

*The following species has no affinity with any other South African Oxalis. It is included in Group 2 of the Analysis of the Species.*

201. *O. monophylla* L., Mant II (1771) 241.—*O. rostrata* Jacq.—*O. lepida* Jacq. Stemless, rather lax, glandular-pilose, 5—12 cm. high.

\*See Introduction, Part III, Errors in Zeyher's localities.

*Bulb* globose, 1—2 cm. in diam, thickly coated with a sponge-like mass of slender splitting and intertwining pale brown fibrous tunics. *Rhizome* short, minutely glandular-pilose. *Leaves*. 2—6, unifoliolate, with petioles 1—3 cm. long: laminae obovate, elliptical or elliptic-oblong, but always tapering somewhat cuneately to the base, obtuse, often slightly emarginate, in the young state conduplicate, sometimes with a narrow cartilaginous margin, very sparsely glandular-pilose or glabrescent, rather densely ciliate with gland-tipped hairs. *Peduncles* 1—6, 1-fl., slender, 3—10 cm. long, rarely with 1—2 minute bracts on the upper half. *Sepals* broadly lanceolate or obovate-lanceolate, 3·5—4·5 mm. long, membranous-margined, purplish on the upper part, callose towards the margins. *Corolla* 1·6—2·4 cm. long, pale rosy lilac or almost white, glandular-pubescent, with a funnel-shaped yellow tube: laminae of the petals obliquely obovate, about as long as the cuneate claw or more rarely the whole petal broadly oblanceolate. *Filaments* glandular-pilose, the shorter 2—3 mm., the longer 3·5—6 mm. long, with short obtuse truncate teeth, the longest rostrate at the apex. *Ovary* 1 mm. long, glandular-pilose on the upper half, the chambers 1-ovuled: styles glandular-pilose. *Capsule* depresso-globose. Seeds without endosperm.

CAPE PENIN.; Lion's Head, Devil's Peak and northern parts. *E.* & *Z.* 701, *Zey.* 223, 2430, *Bolus* 3388, *W-Dod* 1068, *Dummer* 1295, *Pillans* 2491, *Marl.* 1937, *S.* 243/10, 503, 543, 3298, 8088, *Leipoldt* (S.A.M. 48356): STELLENBOSCH Div.; *S.* 5276. Fl. Apl.—May.

✱ Var.  $\beta$  *stenophylla* (Meisn.) Sond.—*O. stenophylla* Meisn., Hook. Lond. Journ. II (1843) 54. Lamina of leaf linear, ligulate or oblanceolate, obtuse, often emarginate, usually longer than the petiole. *Corolla* pale rosy lilac.

MALMESB. Div.; *Pillans* 6646, 6653, *S.* 2439, 3360, 4515: TULBAGH Div.; *S.* 5263: PIQBG. Div.; *Schltr.* 7893, *Edwards* 62: CLANW. Div.; *Pillans* 6653, *S.* 383/19. (*Type*, *Krauss*, Tulbagh, not seen.)

The following are more or less intermediate with the typical form:—

PAARL Div.; *S.* 6001: MALMESB. Div.; *S.* 2237: WELLINGTON Div.; *S.* 4495.

This variety, although strikingly different in its extreme forms, must be admitted with doubt, for the leaves of the typical form become progressively narrower as the species approaches the more northern geographical localities of the variety.

✱ Var.  $\gamma$  *rotundifolia* Salter, Journ. of S.A. Bot. II (1936) 157. Plant smaller. *Leaves* 1—2, with shorter petioles, the lamina larger, broadly suborbicular, broadly cuneate at the base, never conduplicate, entirely glabrous, glaucous above, enlarging (up to 4 cm. in diam.) after the flowering season. *Peduncles* shorter. *Sepals* lanceolate, slightly acuminate.

*Petals* white. *Filaments* more slender, edentate: anthers smaller and paler yellow. (Fig. 73.)

CLANW. Div.; amongst shrublets, 12 miles north of Clanwilliam, S. 3332 (*type* in Bol. Herb.), 673, 2601, 5301, Pillans 6641. Fl. May—June.

Var. ♂ *minor* Salter, l.c. 158. Plant smaller. *Leaves* elliptical, emarginate, 0·8—1·5 cm. long, glaucous. *Peduncles* shorter. *Petals* white. *Sepals* narrow-obovate.

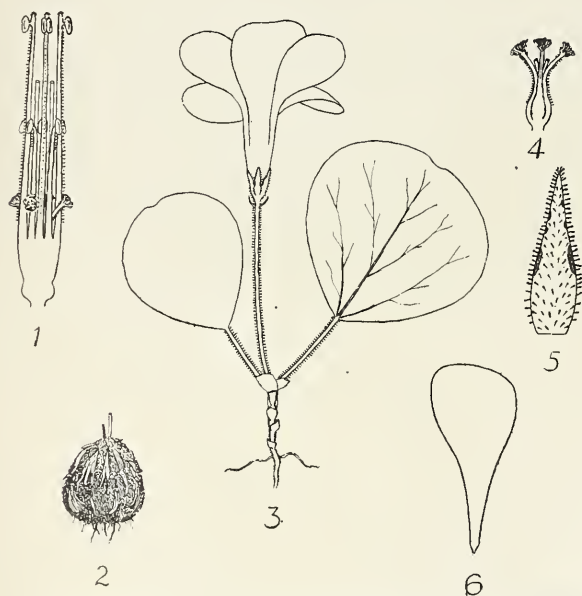


FIG. 73. *Oxalis monophylla*, L., variety *rotundifolia*, Salter. 1. Androecium  $\times 6$ . 2. Bulb, natural size. 3. Plant  $\times 1\frac{1}{2}$ . 4. Gynaecium  $\times 6$ . 5. Sepal  $\times 6$ . 6. Petal  $\times 1\frac{1}{2}$ . (Salter 3332.)

CLANW. Div.; in damp places near Brandewyns River, S. 2463 (*type* in Bol. Herb.), 4438, 5392, Pakhuis Pass, S. 4436, 8142. Fl. May—July.

The longest filaments in *O. monophylla* and its varieties are always rostrate at the apex. In the figure in Jacq. Oxal. tab. 79, f. 3, these projections are omitted. The drawing was, however, made from a dried specimen and it is easy to understand that this character could have been overlooked. (Vide Journ. of S.A. Bot. l.c.)

The following species (except *O. austro-occidentalis* R. Knuth, of which I have seen the fragmentary *type* at Berlin) are unknown to me. The original descriptions do not give sufficient information to enable me to place them in the Analysis of the Species.

- ✕ 202. *O. ligulata* E. Mey. ex Sond., Fl. Cap. I (1860) (324). *Transcript of Sonder's description*. "Stemless, glabrous; outer leaves trifoliolate, with linear, emarginate, dotted leaflets; inner leaves elongate, without leaflets, with a lanceolate-ligulate pellucid petiole; scape longer than the leaves, bi-bracteolate; sepals lanceolate, thrice as short as the large corolla.

LITTLE NAMAQUALAND: rocky places, Drège 3198. Fl. Aug. (Herb. Vind., E. Mey., Sond.)." *Actually Mierenkasteel, Bitterfontein, V.R's Dorp Div.*

An. 1830

"A very remarkable species. Leaves numerous; the leafless petioles (*phyllodia*) a span long, 2 lines wide; the rest 3—4 inches. Leaflets an inch long, 2 lines wide, some shorter and narrower, all either without calli, or below the tips and along the margins marked with a row of spots. Scape 1 ft. high, with 2 sub-opposite bracteoles, 3 lines long. Flower nodding, at length suberect. Sepals 4—5 lines long, obtuse. Corolla campanulate, seemingly flesh-coloured or reddish, an inch or more in length, the tube 4 lines wide, the limbs of the petals rounded, obtuse."

In the absence of the bulb it is only possible to guess at the affinity of this species. It may be a monstrous form of *O. obtusa* Jacq., Form B. (*O. Framesii* L. Bolus).

Note.—There is no specimen in Herb. Sond. at Stockholm, but it is represented at Vienna.

- ✕ 203. *O. Gustavi* R. Knuth, Eng. Bot. Jahrb. LXI Beibl. n. 139 (1927) 1. § Cernuae (Eu-cernuae).

Locality unknown (? Hantam Giberge), *Krebs (type, Berlin)*.

The bulb is unknown. It is said to be distinct in the sub-section Eu-cernuae on account of the wide sinus of the leaflets, the almost sessile flowers and the indument of the calyx, which, however, is not described. The peduncle is 3—8-fld. and the corolla pale yellow (dried). It may be one of the numerous forms of *O. pes caprae* L.

- ✕ 204. *O. laxicaulis* R. Knuth, Eng. Bot. Jahrb. LXI Beibl. n. 139 (1927) 4. § Cernuae (?). *From the original description*. Caulescent, lax, 10—16 cm. high. Root yellowish, with a few rootlets or subsimple. *Apical leaves* scarcely more numerous than the lower, more or less sparse, with long petioles; leaflets cuneate-obcordate, not deeply incised, the larger 12 mm. long, 13 mm. broad, softly pubescent on both faces or glabrescent beneath, the petioles unequal, 2—15 cm. long, 3—12 times



as long as the lamina, pubescent or pilose. *Peduncles* 1-5-fld., cauline (including the flowers) 1-2 times as long as the leaves, like the pedicels and calyx densely clothed with spreading hairs, rarely glabrescent, lax, more or less erect. *Bracts* deciduous, more or less numerous, linear or subulate, somewhat obtuse, fairly densely clothed with spreading subsetose hairs, 1-5 mm. long, membranaceous, reddish-callose at the apex. *Pedicels* 0.5-4 cm. long, very unequal, 4-10 times shorter than the peduncles. *Sepals* lanceolate, acuminate, sharply acute, 5-7 mm. long, membranaceous, callose, but scarcely purplish at the apex, setose-hirsute. *Corolla* 12-13 mm. long, at length "tubuliform",  $2\frac{1}{2}$ - $3\frac{1}{2}$  times as long as the sepals, pale, yellowish at the base: petals spathulate-cuneate, retuse-rotund at the upper margin. Longer stamens about as long as the sepals.

S.W. AFRICA: Angra Pequena, *Hermann* 3, Aus, *Schäfer* 351, Kuibis, *Range* 961, all in Berlin Herb., but *type* not specified.

It is said to be similar in habit to *O. Schaeferi* R. Knuth, from the same localities and from which it is not easily distinguished by the paler corolla callose sepals and by the shape and indument of the leaflets.

It is of little interest in the absence of the bulb.

205. *O. ononifolia* Willd. ex R. Knuth, Pflanzenreich-Oxalis IV 130 (1930) 323. § 7.

WEST CAPE PROVINCE: locality unknown (*type*, Berlin).

The description is apparently of one poor specimen and is too meagre to be worth including here. The bulb is unknown. It is probably a form of *O. minuta* Th.

206. *O. laxiuscula* R. Knuth, Eng. Bot. Jahrb. LXI Beibl. n. 139 (1927) 21. § ?. *From the original description.* Stemless, lax, 11 cm. high. *Bulb* rotund, black, 5—8 mm. in diam. *Rhizome* almost filiform, pale, subterranean, with many capillary rootlets, and with 1—2 dark brown lanceolate scales. *Leaves* basal, few, 3—8, rosulate, lax: leaflets 3, glabrous on both faces, sparsely pilose on the margins, up to 1 cm. long, 8 mm. broad, obcordate or not rarely oblong-obcordate, very thin, green, not callose: petioles up to 8 cm. long, much longer than the leaflets, very lax, filiform, more or less adpresso-pilose, little dilated at the base. *Peduncles* basal, often 1, little longer than the petioles, like the sepals more or less puberulous, 10 cm. long, very thin, lax, scarcely 1 mm. thick, with 2 'setaceous, lax' bracts, 1 mm. long, above the middle. *Sepals* 5—7 mm. long, lanceolate or oblong-lanceolate, acute, the whole apex purple-tinged, but not callose. *Corolla* 18—20 mm. long, broadly conical or conical-campanulate, 4—5 times longer than the sepals: tube whitish-yellow; petals cuneate-obovate, retuse-rotund at the



upper margin, entire, white (dried). Longer stamens  $1\frac{1}{2}$  times longer than the sepals.

CLANW. Div. ; in sandy places on rocky slopes, east side of Olifant's River Valley, 250 ft., *Diels* 365. Fl. Sept.

The description of the shape of the corolla "*late conica vel conico-campanulata*" provides a good instance of the futility of attempting to describe *Oxalis* from dried specimens.

207. *O. albella* R. Knuth. Eng. Bot. Jahrb. LXI Beibl. n. 139 (1927) 20. (*Copied from the original description*). Dwarf, stemless, 3—4.5 cm. high, slender. *Bulb* unknown. *Rhizome* 1 mm. thick, pale, subterranean with a few ovate-rotund obtuse membranous scales, 1—1.5 mm. long. *Leaves* basal, scarcely numerous, rosulate, 6—10 : petioles up to 2.5 cm. long, 3—8 times longer than the leaves, more or less lax, densely pubescent with simple spreading hairs, articulated, but not widening at the base : leaflets 3, pilose on both faces and the margin, up to 4—5 mm. long, little broader, from a broadly cuneate base obcordate, not callosio-tuberculate. *Peduncles* 2—4, basal, like the bracts and sepals puberulous, up to 3 cm. long : bracts 2, setaceous, 2 mm. long, placed above the middle of the peduncle. *Sepals* 3.5—4 mm. long, lanceolate, somewhat acute, indistinctly callose at the apex. *Corolla* white, 1—1.2 cm. long, more or less campanulate (?), 3—4 times longer than the sepals : tube yellowish, as long as the laminae, or not distinct from them : petals from an unguiculate base cuneate-obovate, rotundate-retuse, (*integra* ?) at the apex. *Stamens*, the longer equalling the sepals.

S. W. AFRICA ; Kubub, 4,600 ft., *Range* 203.

Unknown to me. It is possible that it should be included in the § *Oppositæ*.

208. *O. austro-occidentalis* R. Knuth, Eng. Bot. Jahrb. LXI, Beibl. n. 139 (1927) 9. § *Angustatae* (Lineares).

S. W. AFRICA : Oakup, *Pfeil* 64 ! (*type*, Berlin).

A single fragmentary specimen *without bulb or flowers*, perhaps near *O. linearis* Jacq. "My patience is exhausted" !

## APPENDIX I.

The following plants, only known to me in the dried state or of unknown locality are believed to be new species. Since I am unable to describe them in *full* detail, I have refrained from naming them and they are only included here in order that future students of the genus may be aware of their existence.

(i) *Oxalis* sp. . . . (§ Oppositae). Stemless, sparsely villose. *Bulb* narrowly conical, about 5 cm. long, with dark brown splitting tunics. Basal scales ovate, ciliate. *Leaves* usually 4—5 : petioles 2—9 cm. long : leaflets 3, the medial very shortly petiolulate, sub-orbicular, very broadly cuneate at the base, rather widely emarginate, 1·5—2·8 cm. in diam., the two lateral much smaller and slightly oblique, copiously dotted near the margins with minute brown calli, glabrous above, sparsely hairy on the veins below. *Peduncles* 1-fl., up to 15 cm. long : bracts opposite at the upper articulation, 3—4 mm. long, with inconspicuous apical calli. *Sepals* lanceolate, 7—9 mm. long, usually minutely penicillate at the apex. *Corolla* reddish-mauve (dried), up to about 3 cm. long, with a yellow tube. Longer filaments 6 mm. long, edentate. Ovary oblong, 2 mm. long, almost glabrous, the chambers about 10-ovuled. *Capsule* slightly exserted beyond the calyx. Seeds endospermous.

WESTERN PROVINCE : ? Grahamstown ; *Leipoldt* (B.H. 22809). Fl. March.

An affinity of *O. orbicularis* Salter, but more robust and much larger in all parts. It also differs in having penicillate sepals, a larger reddish corolla and in the narrow band of minute round (not elongate) calli close to the margins of the leaves.

(ii) *Oxalis* sp. . . . (? Crassulaceae). Stemless, slender, entirely glabrous 3—4 cm. high. *Bulbs* lanceolate in outline, about 2 cm. long, with an acute beak, often in vertical series as though from the action of a contractile root : tunics rough, brown, splitting. *Rhizome* with a brown cortex, many of the older from previous years persisting around it. Basal scales ovate, brown, rather conspicuous. *Leaves* 6—11 : petioles filiform, wiry, dark brown, 1·5—2 cm. long, swollen near the base, with a small but distinct pulvinus at the apex : leaflets 3, linear, slightly falcate, 1·5—1·8 cm. long, 1—2 mm. broad, strongly involute, pale and scurfy above when dried, dark green beneath. *Peduncles* 1-fl., about as long as the leaves, swollen at the basal articulation : bracts 2, minute, near the calyx. *Sepals* broadly lanceolate, 4·5 mm. long. *Corolla* white ?, about 1·3 cm. long. Longer filaments 5 mm. long.

V. R's DORP DIV. ; on a shale ridge about 18 miles N.W. of V. R's Dorp, on road to V. R's Pass, S 2498.

One dead shrivelled imperfect flower was found early in July, but the bases of peduncles, broken off at the articulation, showed that the plants had flowered earlier. Searches were made in the exact locality in several subsequent seasons, but not even leaves could be found. Bulbs, which were planted, died.

Its nearest affinity is probably *O. pulvinata* Salter, but it is obviously a very distinct species.

(iii) ***Oxalis* sp.** . . . (§ Angustatae-Lineares). Erect, caulescent, about 10 cm. high, finely pubescent. *Stem* 3 cm. long, with a few semi-amplexicaul scales. *Leaves* about 20, terminally congested : petioles mostly 2—3 cm. long : leaflets 3, narrowly cuneate-obovate, obtuse, 6—7 mm. long, glabrous above, pubescent beneath, ciliate with both spreading and introrse hairs. *Peduncles* terminal, 1-fl., up to 5 cm. long, with 2 alternate linear bracts on the upper half. *Sepals* lanceolate, about 4 mm. long, with 2 inconspicuous orange apical calli. *Corolla* glabrous, 1·8—2 cm. long, pink, with a white throat, the tube yellow, very widely funnel-shaped : petals broadly cuneate, about 1 cm. wide. *Filaments* (brevistylar form), the shorter 6 mm., the longer 11—12 mm. long, edentate. *Ovary* pubescent and with vermilion calli on the upper half, the chambers 2-ovuled.

WESTERN PROVINCE : Locality unknown ; cult. ex Hort. *C. L. Leipoldt* (B.H. 28817). Fl. May.

Perhaps a form of the polymorphous *O. ciliaris* Jacq., but differing in its wider leaflets and in the shape of the corolla which has a distinct white "eye", the tube being wider and the petals cuneate and not attenuate into a claw at the base. Bulb not seen.

## APPENDIX II.

List of specimens collected by the author, in numerical sequence, with their final determinations. Many of these were originally distributed with names other than those under which they appear in this work. All these specimens are designated by the letter *S*. The authors of varieties have been omitted, but will be found in their appropriate place in the text.

### 243—565

243/10 monophylla L.—243/11 glabra Thunb.—243/11A pusilla Jacq.—243/13 polyphylla Jacq.—243/14 falcatula Salter.—243/15 tenuifolia Jacq.—243/16 minuta Thunb.—243/17 multicaulis E. & Z.—243/20 nidulans E. & Z.—244/1 nidulans E. & Z.—244/4 punctata L.f.—244/6 luteola Jacq.—244/8 obtusa Jacq.—244/9 lanata L.f.—244/10 natans L.f.—244/11 incarnata L.—244/12 bifida Thunb.—244/13 hirta L. Fm. A.—245/16 tomentosa L.f.—245/17 flava L. Fm. A.—245/19 pes caprae L. v. sericea.—245/20 compressa L.f.—245/21 pes caprae L.—245/22 caprina L.—245/23 dentata Jacq.—371/28 obtusa Jacq.—373/12 Eckloniana Presl. v. Sonderi.—375/16 fabaeifolia Jacq. Fm. A.—375/17 Salteri L. Bolus.—375/18A, 18B hirta L. v. tubiflora Fm. A.—375/19A. flava Fm. D.—376/57 Robinsonii Salter & Exell. Fm. A.—376/59 ciliaris Jacq. Fm. A.—377/61 Smithiana E. & Z.—379/46 stenorrhyncha Salter.—380/90 depressa E. & Z.—380/91B psilopoda Turcz.—380/92 stellata E. & Z. 383/1, 2, adspersa E. & Z.—383/4, 6 livida Jacq. v. altior.—383/5 Eckloniana Presl. v. Sonderi.—383/6A perineson Salter & Exell.—383/7, 8 gracilis Jacq.—383/9 Eckloniana Presl. Fm. B.—383/10 Eckloniana Presl. v. hopefieldiana.—383/11 viscosa E. Mey. ex Sond.—383/12 ebracteata Savign.—383/14 adspersa E. & Z.—383/16, 18 tenella Jacq.—383/17 pes caprae L. v. sericea.—383/20 polyphylla Jacq. v. pubescens.—383/21 flava L. Fm. A.—383/22 ioeides Salter & Exell.—383/25 aurea Schltr.—383/27 Pillansiana Salter & Exell.

501 pes caprae L. v. sericea.—503 monophylla L.—504 falcatula Salter.—505 flava L. Fm. A.—506. hirta L. v. canescens.—507 dentata Jacq.—508 tomentosa L.f.—510, 511 purpurea L. Fm. A.—512 dentata Jacq.—513 caprina L.—519 polyphylla Jacq.—522 strigosa Salter.—523 caprina L.—524 hirta L. Fm. E.—525 Eckloniana Presl. v. Sonderi.—526 commutata Sond.—535 purpurea L. Fm. A.—536 Eckloniana Presl. v. Sonderi.—541 hirta L. Fm. E.—542 Eckloniana Presl. v. Sonderi.—543 monophylla L.—557 strigosa Salter.—558 bifida Thunb.—559 hirta L. Fm. E.—560 versicolor L. Fm. B.—561 pes caprae L. v. sericea.—562 hirta L. Fm. A.—563 dentata Jacq.—564 polyphylla Jacq.—565

**566—754**

*luteola* Jacq.—566 *Eckloniana* Presl. Fm. C.—567 *Eckloniana* Presl. v. *Sonderi*.—568 *bifida* Thunb.—571 *hirta* L. Fms. A & B.—572 *Eckloniana* Presl. v. *Sonderi*.—573 *argyrophylla* Salter.—574 *hirta* L. Fm. A.—575 *commutata* Sond.—577 *punctata* L.f. Fm. A.—578 *pes caprae* L. v. *sericea*.

603 *truncatula* Jacq.—604 *Engleriana* Schltr.—605 *Eckloniana* Presl. v. *Sonderi*.—606 *polyphylla* Jacq.—607 *luteola* Jacq.—608 *tenuifolia* Jacq.—609 *commutata* Sond.—617 *luteola* Jacq.—618 *polyphylla* Jacq. v. *pentaphylla*.—619, 620 *versicolor* L. Fm. B.—621 *commutata* Sond. v. *concolor*.—622, 623 *Eckloniana* Presl. v. *Sonderi*.—628 *versicolor* L. Fm. A.—645 *purpurea* L. Fm. A.—646 *multicaulis* E. & Z.—652 *hirta* L. Fm. F.—653 *luteola* Jacq.—654 *Eckloniana* Presl. Fm. B.—654A *purpurea* L. Fm. I.—655 *argyrophylla* Salter.—655A *hirta* L. Fm. A.—657, 658 *adpersa* E. & Z.—659 *Eckloniana* Presl. Fm. B.—660 *fragilis* Salter.—661, 662 *flava* L. Fm. E.—654 *purpurea* L. Fm. E.—655 *variifolia* Steud.—657 *adpersa* E & Z.—658 *viscosa* E. Mey. ex x 668  
Sond.—672 *tenella* Jacq.—673 *monophylla* L. v. *rotundifolia*.—674 *gracilis* Jacq.—675 *hirta* L. v. *tubiflora*.—676 *purpurea* L. Fm. E. (i).—676A *purpurea* L. Fm. D.—677 *purpurea* L. Fm. E (i).—679 *Pillansiana* Salter & Exell.—680 *viscosa* E. Mey. ex Sond.—681 *hirta* L. v. *polioeides*.—682 *flava* L. Fm. D.—684 *pes caprae* L. Fm. B.—689 *flava* L. Fm. D.—690 *tenella* Jacq.—691 *Dregei* Sond.—692 *flava* L. Fm. A.—693 *obtusa* Jacq.—694 *fabaeifolia* Jacq. Fm. A.—695 *Salteri* L. Bolus.—698 *pes caprae* L. Fm. B.—700 *suteroides* Salter.

701 *flava* L. Fm. A.—702 *purpurata* Jacq.—702A *obtusa* Jacq.—703, 703A *flava* L. Fm. H.—704 *melanosticta* Sond. v. *latifolia*.—705 *Massoniana* Salter.—706 *Pocockiae* L. Bolus.—710 *Salteri* L. Bolus.—711 *deserticola* Salter.—712 *fabaeifolia* Jacq. Fm. B. (i).—713 *pes caprae* L. v. *sericea*.—714 *melanograptia* Salter.—715 *Salteri* L. Bolus.—716 *campicola* Salter.—717 *purpurea* L. Fm. D.—718 *fabaeifolia* Jacq. Fm. A.—719 *Salteri* L. Bolus.—721 *obtusa* Jacq.—724 *purpurea* L. Fm. E.—725, 725A *flava* L. Fm. E.—726 *phloxidiflora* Schltr.—727 *aurea* Schltr.—728 *purpurea* Fm. E.—729 *flava* L. Fm. A.—731 *hirta* L. v. *tubiflora*.—732, 733 *ebracteata* Savign.—734 *livida* Jacq. v. *altior*.—735 *obtusa* Jacq.—736 *flava* L. Fm. E.—736B *fabaeifolia* Jacq. Fm. B. (ii).—737 *purpurea* L. Fm. A.—738 *adpersa* E & Z.—739 *pallens* E & Z.—740 *adpersa* E & Z.—741 *glabra* Thunb.—742 *ebracteata* Savign.—743 *viscosa* E. Mey. ex Sond.—744 *purpurea* L. Fm. E.—745 *hirta* L. v. *tubiflora*.—747 *pulchella* Jacq. v. *tomentosa*.—748 *pallens* E & Z.—749 *Eckloniana* Presl. v. *Sonderi*.—750 *polyphylla* Jacq. v. *pubescens*.—751 *tenella* Jacq.—752 *livida* Jacq. v. *altior*.—753 *adpersa* E & Z.—754 *pes*



757—1033

caprae L. v. sericea.—757 variifolia Steud.—766 glabra Thunb.—767 versicolor L. Fm. A.—768 minuta Thunb.—769 commutata Sond.—770 minuta Thunb.—772 luteola Jacq.—773 argyrophylla Salter.—774 pusilla Jacq.—775 purpurea L. Fm. C.—776 Eckloniana Presl. v. Sonderi.—777 hirta L. Fm. C.—778 argyrophylla Salter.—779 Eckloniana Presl. v. Sonderi.—780 commutata Sond.—781 argyrophylla Salter.—782 hirta L. Fm. C.—783 hirta L. Fm. A.—784 polyphylla Jacq.—789 Eckloniana Presl. v. hopefieldiana.—790 hirta L. Fm. C.—791 hirta L. Fm. D.—800 campylorrhiza Salter.

801 reclinata Jacq. v. gracillima.—802 obtusa Jacq.—803A pulchella Jacq. v. glauca.—803B ambigua Jacq. v. fuscata.—809 obtusa Jacq.—812 comosa E. Mey. ex Sond.—814 purpurea L. Fm. G.—817 inconspicua Salter.—818 Louisae Salter.—819 namaquana Sond.—820 Sonderiana (O. Kuntze) Salter.—825 pes caprae L. Fm. B.—832 comosa E. Mey. ex Sond.—833 namaquana Sond.—847 pulchella Jacq. v. glauca.—848 adenodes Sond. Fm. B.—849 obtusa Jacq.—850 pulchella Jacq. v. glauca.—851 helicoides Salter.—853 adenodes Sond. Fm. D.—854 furcillata Salter v. caulescens.—855 exserta Salter.—857 helicoides Salter v. alba.—858 flava L. Fm. C.—859 Dregei Sond.—860 campylorrhiza Salter.—867 exserta Salter.—870A pulchella Jacq. v. glauca.—870B ambigua Jacq. v. fuscata.—877 grammopetala Sond.—890 furcillata Salter v. caulescens.—891 obtusa Jacq.—892, 892A adenodes Sond. Fm. A.—893 obtusa Jacq.—896 flaviuscula Salter.—897 campylorrhiza Salter.—899 obtusa Jacq.—900 grammopetala Sond.

901 adenodes Sond. Fm. A.—901A exserta Salter.—901B adenodes Sond. Fm. B.—905 helicoides Salter.—906 exserta Salter.—908 pulchella Jacq. v. glauca.—910 obtusa Jacq.—913 foveolata Turcz.—917 Sonderiana (O. Kze.) Salter.—918, 919 purpurea L. Fm. G.—922A ambigua Jacq. Fm. C.—922B stenoptera Turcz.—923 Sonderiana (O. Kze.) Salter v. alba.—924 adenodes Sond. Fm. B.—925 pulchella Jacq. v. tomentosa.—926, 926A reclinata Jacq. v. micromera.—927 clavifolia Sond.—928 lichenoides Salter.—930 rhomboidea Salter.—932A crispula Sond.—932B crispula Sond. v. glandulosa.—940 pes caprae L. Fm. B.—942 obtusa Jacq.—943 pes caprae L. Fm. B.—945, 950 stenoptera Turcz. v. alba.—955 purpurea L. Fm. A.—962 linearis Jacq.—968 bullulata Salter.—984 hirta L. v. polioeides.—989 nidulans E & Z. v. denticulata.—992 lanata L. f. v. rosea.—996 lanata L. f.—997 nidulans E & Z. v. denticulata.

1001. luteola Jacq.—1002 lanata L.f.—1003 nidulans E & Z.—1004 pes caprae L. Fm. A.—1008 glabra Thunb.—1009 Eckloniana Presl. v. Sonderi.—1021 glabra Thunb.—1022 purpurea L. Fm. A.—1033 glabra

## 1034—1680

Thunb.—1034 *tenuifolia* Jacq.—1035, 1035A *goniorrhiza* E & Z.—1036 *multicaulis* E & Z.—1037 *obtusata* Jacq.—1039 *nidulans* E & Z.—1047 *microdonta* Salter.—1048 *ciliaris* Jacq. Fm. D.—1049 *convexula* Jacq.—1050 *obtusata* Jacq.—1052 *fibrosa* Bolus f.—1078 *ciliaris* Jacq. Fm. C.—1079 *convexula* Jacq.—1080, 1081 *orbicularis* Salter.—1082 *obtusata* Jacq.—1092 *pes caprae* L. Fm. B.—1095 *glabra* Thunb.—1130 *obtusata* Jacq.—1142 *luteola* Jacq.—1143 *purpurea* L. Fm. A.—1144 *multicaulis* E & Z.—1145 *goniorrhiza* E & Z.—1160 *obtusata* Jacq.—1161 *glabra* Thunb.—1168 *versicolor* L. Fm. B.—1170 *nidulans* E & Z. v. *denticulata*.—1176, 1182 *luteola* Jacq.—1183 *multicaulis* E & Z.—1187 *versicolor* L. v. *latifolia*.—1188 *obtusata* Jacq.—1190 *glabra* Thunb.

1219 *Engleriana* Schltr.—1220 *Eckloniana* Presl. v. *Sonderi*.—1225 *zeekoevleyensis* R. Knuth.—1228 *depressa* E & Z.—1231 *purpurea* L. Fm. B.—1245 *versicolor* L. Fm. A.—1254, 1255 *glabra* Thunb.—1256 *pulchella* Jacq. v. *tomentosa*.—1285 *obtusata* Jacq.—1286 *lanata* Lf.—1291 *versicolor* L. Fm. A.—1295 *obtusata* Jacq. Fm. B.—1299 *hirta* L. Fm. A.—1300 *tenuifolia* Jacq.—1301 *compressa* Lf.—1304 *obtusata* Jacq.—1305 *incarnata* L.—1309, 1313, 1334 *obtusata* Jacq.—1336 *multicaulis* E & Z.—1340 *lanata* Lf. (*virescent*).—1341 *obtusata* Jacq.—1342, 1343 *versicolor* L. Fm. A.—1360 *nidulans* E & Z.—1362 *obtusata* Jacq.—1367 *purpurea* L. Fm. B.—1369 *purpurea* L. Fm. H.—1372 *hirta* L. v. *polioeides*.—1374 *reclinata* Jacq. v. *micromera*.

1405A *helicoides* Salter.—1405B *exserta* Salter.—1406A *pulchella* Jacq. v. *glauca*.—1406B *exserta* Salter.—1407 *pulchella* Jacq. v. *bene-protecta*.—1408 *obtusata* Jacq.—1410A *flaviuscula* Salter v. *longifolia*.—1412 *furcillata* Salter v. *caulescens*.—1466 *obtusata* Jacq.—1467 *obtusata* Jacq. Fm. B.—1469 *exserta*. Salter.—1471 *adenodes* Sond. Fm. B.—1480 *comosa* E. Mey. ex Sond.—1481 *obtusata* Jacq.—1484 *furcillata* Salter v. *caulescens*.—1486, 1503 *obtusata* Jacq.—1538 *stenoptera* Turcz. v. *alba*.—1539 *obtusata* Jacq.—1544 *adenodes* Sond. Fm. A.—1546A *Sonderiana* (O. Kze.) Salter.—1547 *exserta* Salter.—1548 *comosa* E. Mey. ex Sond.—1572 *virginica* Jacq.—1573 *ambigua* Jacq. Fm. B.—1574 *ambigua* Jacq. Fm. A.—1578 *obtusata* Jacq.—1579A, 1579B *reclinata* Jacq. v. *micromera*.—1580 *linearis* Jacq.—1586 *purpurea* L. Fm. D.—1588 *stenoptera* Turcz. v. *alba*.

1606 *melanosticta* Sond. v. *latifolia*.—1607 *Massoniana* Salter.—1610, 1610A *flava* L. Fm. H.—1612 *heterophylla* D.C.—1613B, 1614, 1641 *obtusata* Jacq.—1648 *melanosticta* Sond. v. *latifolia*.—1649A *callosa* R. Knuth.—1649B *suteroides* Salter v. *latituba*.—1649C *stenopetala* Salter.—1605A *grammophylla* Salter Fm. A.—1650B *campicola* Salter.—1651 *grammophylla* Salter Fm. B.—1653 *Pocockiae* L. Bolus.—1680

## 1681—2231

glabra Thunb.—1681 adpersa E & Z.—1682 ebracteata Savign.—1683 hirta L. v. tubiflora.—1684 pulchella Jacq. v. tomentosa.—1705 flava L. Fm. E.—1706 flava L. Fm. A.—1706B purpurea L. Fm. D.—1708 obtusa Jacq.—1709 commutata Sond.—1712 natans L.f.—1748 tenuifolia Jacq.—1749 argyrophylla Salter.—1772 tenuifolia Jacq.—1800, 1847 versicolor L. Fm. A.—1911 incarnata L.—1937 obliquifolia Steud. ex Rich.

2014 heterophylla D.C.—2039 polyphylla Jacq.—2043 Pocockiae L. Bolus.—2065 bifida Thunb.—2067 polyphylla Jacq. v. pubescens.—2069 falcata Salter.—2071 polyphylla Jacq. v. alba.—2096A Meisneri Sond. Fm. C.—2096B Meisneri Sond. Fm. D.—2098 ebracteata Savign.—2099 stellata E & Z. v. glandulosa.—2100 glabra Thunb.—2101 bifida Thunb.—2102 commutata Sond.—2106 capillacea E. Mey. ex Sond. Fm. B.—2107 Pocockiae L. Bolus.—2109 heterophylla D.C. Fm. B.—2110 capillacea E. Mey. ex Sond. Fm. C.—2111 Eckloniana Presl. v. Sonderi.—2112 capillacea E. Mey. ex Sond. Fm. C.—2113, 2115 polyphylla Jacq.—2116 truncatula Jacq.—2129 adpersa E & Z.—2130 flava L. Fm. A.—2131 aurea Schltr.—2133 giftbergensis Salter.—2134 luteola Jacq.—2135 livida Jacq. v. altior ?—2137 tenella Jacq.—2138 flava L. Fm. B.—2139 Eckloniana Presl. v. Sonderi.—2140 oreophila Salter.—2141 flava L. Fm. A.—2144 Massoniana Salter.—2145 flava L. Fm. A.—2147 pes caprae L. v. sericea.—2149 purpurea L. Fm. E (i).—2163 hirta L. Fm. E.—2164 tomentosa L.f.—2165 flava L. Fm. A.—2166 adpersa E & Z.—2167 hirta L. v. intermedia.—2168 leptocalyx Sond.—2169 droseroides E. Mey. ex Sond.—2170 purpurea L. Fm. K.—2171A Meisneri Sond. Fm. C.—2171B Meisneri Sond. Fm. D.—2172 commutata Sond.—2173 glabra Thunb.—2174 ebracteata Savign.—2175 commutata Sond.—2176 Eckloniana Presl. v. Sonderi.—2178 leptogramma Salter.—2179 ciliaris Jacq. Fm. B.—2180 flava L. Fm. A.—2181 depressa E & Z.—2182 flava L. Fm. A.—2183 depressa E & Z.—2184 pulchella Jacq. v. tomentosa.—2186 Burkei Sond.—2187 fibrosa Bolus f.—2188, 2189 flava L. Fm. A.—2190 depressa E & Z.—2191 Zeyheri Sond.—2192 melanosticta Sond.—2193 flava L. Fm. E.—2194 Burkei Sond.—2195 Eckloniana Presl. v. Sonderi.—2196 fibrosa Bolus f.—2197, 2200 depressa E & Z.

2201, 2202 flava L. Fm. E.—2203 leptogramma Salter v. brevifolia.—2205 Zeyheri Sond.—2206 Pocockiae L. Bolus.—2207 Burkei Sond.—2208 leptogramma Salter v. brevifolia.—2210 Pocockiae L. Bolus.—2212 Stokoei Weintroub.—2213 ciliaris Jacq. Fm. C.—2213A depressa E & Z.—2214 capillacea E. Mey. ex Sond. Fm. B.—2215 Eckloniana Presl. v. Sonderi.—2216 capillacea E. Mey. ex Sond. Fm. C.—2217 Pocockiae L. Bolus.—2218 Burkei Sond.—2219, 2230 Pocockiae L. Bolus.—2231,

**2232—2377**

2232 Eckloniana Presl. v. Sonderi.—2233 capillacea E. Mey. ex Sond Fm. A.—2236 hirta L. Fm. F.—2237 monophylla L. v. stenophylla.—2258 hirta L. Fm. F.—2259 lateriflora Jacq.—2260 purpurea L. Fm. A.—2261 commutata Sond.—2262 lateriflora Jacq.—2263 tenuifolia Jacq.—2264 hirta L. v. intermedia.—2265 goniorrhiza E & Z.—2267 hirta L. Fm. E.—2271 adspersa E & Z.—2272 commutata Sond.—2273 multi-caulis E & Z.—2274 capillacea E. Mey. ex Sond. Fm. A.—2275 hirta L. v. intermedia.—2276. versicolor L. v. flaviflora.—2277 ebracteata Savign.—2278 leptocalyx Sond.—2279 amblyodonta Salter Fm. A.—2280 capillacea E. Mey. ex Sond. Fm. A.—2281 Stokoei Weintroub.—2282A, 2282B, 2283 adspersa E & Z.—2284 Eckloniana Presl. v. Sonderi.—2285 obtusa Jacq.—2288 commutata Sond. v. montana.—2289 flava L. Fm. A.—2290 stenorrhyncha Salter.—2291 Smithiana E & Z.—2295, 2296 commutata Sond.—2297 Eckloniana Presl. v. Sonderi.—2298 commutata Sond.—2299, Eckloniana Presl. v. Sonderi—2300 Engleriana Schltr.

2301 Eckloniana Presl. v. Sonderi.—2302 goniorrhiza E & Z.—2303 commutata Sond.—2304 Engleriana Schltr.—2305 nidulans E & Z. v. denticulata.—2306 glabra Thunb.—2307 goniorrhiza E & Z.—2308 camelopardalis Salter.—2309 Eckloniana Presl. v. Sonderi.—2310 pseudo-hirta Salter.—2311 flava L. Fm. E.—2312 Engleriana Schltr.—2313 Eckloniana Presl. v. Sonderi Fm. B.—2315 stellata E & Z. v. montaguensis.—2316 leptogramma Salter v. lutea.—2317 ciliaris Jacq. Fm. D.—2318 microdonta Salter.—2319, 2320 ciliaris Jacq. Fm. C.—2321 leptogramma Salter v. lutea.—2322 ciliaris Jacq. Fm. C.—2323 orbicularis Salter.—2327 ciliaris Jacq. Fm. C.—2328 depressa E & Z.—2330 stellata E & Z. v. glandulosa.—2331 fibrosa Bolus f.—2332 anomala Salter.—2333 depressa E & Z.—2334 anomala Salter.—2338 imbricata E & Z. v. violacea Fm. A.—2340 ciliaris Jacq. Fm. A.—2341 attaquana Salter.—2342 ioeides Salter & Exell.—2343 caprina L.—2344 polyphylla Jacq.—2345 Eckloniana Presl. v. Sonderi.—2346 depressa E & Z.—2348 Robinsonii Salter & Exell Fm. A.—2349 punctata L.f. Fm. B.—2350 psilopoda Turcz.—2351 polyphylla Jacq.—2353 Robinsonii Salter & Exell Fm. A.—2354 ciliaris Jacq. Fm. A.—2355 punctata L.f. Fm. B.—2357 Robinsonii Salter & Exell Fm. B.—2358 ciliaris Jacq. Fm. B.—2359 orthopoda Salter.—2360 psilopoda Turcz.—2362 imbricata E & Z. v. violacea Fm. A.—2363 Robinsonii Salter & Exell Fm. A.—2364 ciliaris Jacq. Fm. B.—2366 caprina L.—2367 ciliaris Jacq. Fm. B.—2368 polyphylla Jacq.—2369, 2370 ciliaris Jacq. Fm. B.—2371 polyphylla Jacq.—2372 punctata L.f. Fm. B.—2374 ciliaris Jacq. Fm. B.—2375 polyphylla Jacq.—2376 Robinsonii Salter & Exell Fm. A.—2377 orthopoda



2378—2514

Salter.—2378 imbricata E & Z. v. cuneifolia Fm. A.—2380 confertifolia (O. Kze.) R. Knuth v. petiolata.—2381 ciliaris Jacq. Fm. A.—2382 Eckloniana Presl. v. Sonderi.—2383, 2384 confertifolia (O. Kze.) R. Knuth.—2385 heidelbergensis Salter.—2386 Eckloniana Presl. v. Sonderi.—2387 imbricata E & Z. v. cuneifolia Fm. B.—2388 confertifolia (O. Kze.) R. Knuth.—2389 Eckloniana Presl. v. Sonderi.—2390, 2391 ciliaris Jacq. Fm. A.—2393, 2394 Eckloniana Presl. v. Sonderi.—2395 zee-koevleyensis R. Knuth.—2396 Eckloniana Presl. v. Sonderi.—2397 stellata E & Z. v. glandulosa.—2398 nidulans E & Z.—2399 truncateata Jacq.

2401 minuta Thunb.—2402 commutata Sond.—2403 luteola Jacq.—2405 Eckloniana Presl. v. Sonderi.—2406 polyphylla Jacq.—2407 stictocheila Salter.—2408 hirta L. Fm. D.—2409 Eckloniana Presl. v. hopefieldiana.—2410 luteola Jacq.—2411 goniorrhiza E & Z.—2412 hirta L. Fm. C.—2413 argyrophylla Salter.—2417 adspersa E & Z.—2418 fragilis Salter.—2419 Eckloniana Presl. Fm. B.—2420 purpurea L. Fm. B.—2421 hirta L. v. polioeides.—2422 adspersa E & Z.—2423 capillacea E. Mey. ex Sond. Fm. A.—2424, 2425, 2426 adspersa E & Z.—2428 purpurea L. Fm. B.—2433 leptocalyx Sond.—2434 argyrophylla Salter.—2435 hirta L. v. intermedia.—2435A adspersa E & Z.—2436 perineson Salter & Exell.—2437 fragilis Salter v. pellucida.—2438 perineson Salter & Exell.—2439 monophylla L. v. stenophylla.—2439A hirta L. v. polioeides.—2440 purpurea L. Fm. B.—2441 tenella Jacq. Fm. B.—2442 viscosa E. Mey. ex Sond.—2443 adspersa E & Z.—2444 pallens E & Z.—2448 purpurea L. Fm. E (i).—2450 phloxidiflora Schltr.—2451 obtusa Jacq.—2454 porphyriosiphon Salter.—2458 pes caprae L. Fm. B.—2459 obtusa Jacq.—2462 phloxidiflora Schltr.—2463 monophylla L. v. minor.—2464 simplex Salter.—2465 phloxidiflora Schltr.—2466 purpurea L. Fm. D.—2467 aridicola Salter.—2468 grammophylla Salter Fm. B.—2469 stenopetala Salter.—2470 xantha Salter.—2471 obtusa Jacq.—2472 xantha Salter.—2473 lineolata Salter.—2474 purpurea L. Fm. D.—2475 stenopetala Salter.—2476 disticha Jacq. v. alba.—2477 obtusa Jacq.—2478 grammophylla Salter Fm. C.—2479 purpurea L. Fm. D.—2480 campicola Salter.—2481 primnoides R. Knuth.—2482 callosa R. Knuth v. minor.—2488 fabaefolia Jacq. Fm. B (ii).—2489 purpurea L. Fm. D.—2491 melanograpta Salter.—2492 argillacea Bolus f.—2493 deserticola Salter.—2494 obtusa Jacq.—2495 reflexa Salter.—2498 § Crassulae (*Appendix I*).—2499 tenella Jacq.—2500 suteroides Salter.

2501 purpurea L. Fm. D.—2502 Annae Bolus f. Fm. B.—2503 compressa L.f. v. purpurascens.—2510 senecta Salter.—2511 Annae Bolus f. Fm. B.—2512 stenoptera Turcz. v. alba.—2513 bullulata Salter.—2514



**2515—3181B**

stenoptera Turcz. v. undulata.—2515 stenoptera Turcz. v. alba.—2516 obtusa Jacq.—2518 linearis Jacq.—2519 purpurea L. Fm. D.—2520 ambigua Jacq. Fm. C.—2521 Annae Bolus f. Fm. B.—2522 ambigua Jacq. Fm. C.—2525 Annae Bolus f. Fm. B.—2526 cathara Salter.—2527 ambigua Jacq. Fm. C.—2528 Annae Bolus f. Fm. B.—2529 ambigua Jacq. Fm. B.—2530 pulchella Jacq. v. glauca.—2531 clavifolia Sond.—2532 obtusa Jacq.—2553 namaquana Sond.—2554 gracilis Jacq.—2555 pulchella Jacq. v. glauca.—2557 Louisae Salter.—2558 ambigua Jacq. v. fuscata.—2559 furcillata Salter v. caulescens.—2560 flava L. Fm. C.—2562 adenodes Sond. Fm. D.—2563 flaviuscula Salter v. longifolia.—2564 primuloides R. Knuth.—2565 obtusa Jacq.—2567 adenodes Sond. Fm. B.—2568 pulchella Jacq. v. glauca.—2569 Knuthiana Salter.—2570, 2571 obtusa Jacq.—2572 grammopetala Sond.—2573 copiosa Bolus f. Fm. A.—2574 obtusa Jacq.—2576 furcillata Salter.—2577, 2578 obtusa Jacq.—2579 pulchella Jacq. v. glauca.—2580 adenodes Sond. Fm. A.—2583 obtusa Jacq.—2584 obtusa Jacq. v. atrata.—2585 pulchella Jacq. v. beneprotecta.—2586 obtusa Jacq.—2587 adenodes Sond. Fm. C.—2588 purpurea L. Fm. G.—2589 obtusa Jacq.—2590 inconspicua Salter.—2592 purpurea L. Fm. G.—2593 furcillata Salter.—2599 flava L. Fm. G (ii)—2600 purpurea L. Fm. E (i).

2601 monophylla L. v. rotundifolia.—2602 disticha Jacq. v. alba.—2607 compressa L.f.—2608 disticha Jacq.—2609 glabra Thunb.—2610, 2611 capillacea E. Mey. ex Sond. Fm. A.—2612 amblyodonta Salter Fm. B.—2613 callimarginata Weintraub.—2614 Urbaniana Schltr.—2615 disticha Jacq.—2622 commutata Sond.—2633 commutata Sond. v. montana.—2636 heterophylla D.C. Fm. B.—2639 obtusa Jacq.—2641 pes caprae L. Fm. B.—2643 purpurea L. Fm. D.—2644 Zeyheri Sond.—2645 Annae Bolus f. Fm. A.—2648 goniorrhiza E & Z.—2649, 2651 nidulans E & Z.—2652 leptocalyx Sond.—2653 goniorrhiza E & Z.—2655 glabra Thunb.—2656 tenuifolia Jacq.—2671 glabra Thunb.—2674, 2675 Urbaniana Schltr.—2677 latifolia H.B.K.—2680 obtusa Jacq.—2699 disticha Jacq.—2701 lanata L.f.—2726 obtusa Jacq.—2730 recticaulis Sond.—2791 versicolor L. Fm. A.—2825 obtusa Jacq.

3016 flava L. Fm. G(i).—3044 caprina L.—3047 polyphylla Jacq.—3063 punctata L.f. Fm. C.—3071 truncatula Jacq.—3095 melanosticta Sond.—3101 zeekoevleyensis R. Knuth.—3102 depressa E & Z.—3103 zeekoevleyensis R. Knuth.—3106 fibrosa Bolus f.—3114 Zeyheri Sond.—3121, 3122 fibrosa Bolus f.—3131 caprina L.—3160 ciliaris Jacq. Fm. A.—3161, 3162 imbricata E & Z. v. violacea Fm. A.—3163 purpurea L. Fm. F.—3164 pendulifolia Salter.—3175 stellata E & Z. v. gracilior.—3176 polyphylla Jacq.—3177, 3181A punctata L.f. Fm. C.—3181B imbricata

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E & Z. v. violacea Fm. A.—3182 ciliaris Jacq. Fm. A.—3185 purpurea L. Fm. F.—3196 imbricata E & Z. v. violacea Fm. A.—3200 purpurea L. Fm. F.

3201, 3202 ciliaris L. Fm. A.—3203 caprina L.—3204 imbricata E & Z. v. violacea Fm. A.—3204B psilopoda Turcz.—3205 ciliaris Jacq. Fm. A.—3209 polyphylla Jacq.—3216, 3231 imbricata E & Z. v. violacea Fm. A.—3232 caprina L.—3233 ciliaris Jacq. Fm. A.—3237 punctata L.f. Fm. B.—3248 polyphylla Jacq.—3262 ioeides Salter & Exell.—3269 imbricata E & Z.—3273 Robinsonii Salter & Exell. Fm. A.—3274, 3275 ciliaris Jacq. Fm. A.—3276 polyphylla Jacq.—3277 punctata L.f. Fm. B.—3278 Robinsonii Salter & Exell. Fm. B.—3286 polyphylla Jacq.—3288 truncatula Jacq.—3289 lanata L.f. v. rosea.—3296 nidulans E & Z. v. denticulata.—3297 commutata Sond.—3298 monophylla L.—3299 falcata Salter—3300 hirta L. Fm. E.

3301 pusilla Jacq.—3302 hirta L. Fm. A.—3303 versicolor L. Fm. A.—3304 hirta L. Fm. E.—3306 hirta L. Fm. A.—3307 commutata Sond.—3308 dentata Jacq.—3309 polyphylla Jacq. v. pentaphylla.—3310 stellata E & Z. v. glandulosa.—3311 stellata E & Z.—3312 stellata E & Z. v. glandulosa.—3313 depressa E & Z.—3314 Engleriana Schltr.—3315 polyphylla Jacq.—3320 adpersa E & Z.—3321 tenella Jacq.—3322 adpersa E & Z.—3323 tenella Jacq.—3324 macra Schltr.—3325 adpersa E & Z.—3326 Eckloniana Presl. Sonderi.—3327 luteola Jacq.—3328 pulchella Jacq. v. tomentosa.—3329 adpersa E & Z.—3330 uliginosa Schltr.—3331 gracilis Jacq.—3332 monophylla L. v. rotundifolia.—3334 Sonderiana (O. Kze.) Salter v. alba.—3335 gracilis Jacq.—3336 purpurea L. Fm. H.—3337 fabaefolia Jacq. Fm. A.—3338 Dregei Sond.—3339 Bowiei Lindl.—3341 hirta L. Fm. E.—3342 multicaulis E & Z.—3343 falcata Salter *inter.* polyphylla Jacq.—3345 pusilla Jacq.—3348 Eckloniana Presl. v. Sonderi.—3351 commutata Sond.—3352 Eckloniana Presl. v. hopefieldiana.—3353 hirta L. Fm. C.—3354 glabra Thunb.—3355 Eckloniana Presl. Fm. B.—3356 purpurea L. Fm. A.—3357 hirta L. Fm. D.—3358 levis Salter.—3360 monophylla L. v. stenophylla.—3361 argyrophylla Salter.—3362 glabra Thunb.—3363 minuta Thunb.—3364 glabra Thunb.—3367 tenuifolia Jacq.—3370 commutata Sond.—3372 multicaulis E & Z.—3373 Eckloniana Presl. v. hopefieldiana.—3374 lateriflora Jacq.—3376 tenuifolia Jacq.—3381 involuta Salter.—3382 adpersa E & Z.—3383 recticaulis Sond.—3386 purpurea L. Fm. H.—3387 bullulata Salter.—3388 rhomboidea Salter.—3389 obtusa Jacq.—3392 reclinata Jacq. v. micromera.—3394, 3395 ambigua Jacq. Fm. C.—3396 Annae Bolus f. Fm. B.—3398 pulchella Jacq. v. glauca.—3400 obtusa Jacq. Fm. B.

3401 virginea Jacq.—3406 gracilis Jacq. v. purpurea.—3407 ambigua

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Jacq. Fm. C.—3408 *gracilis* Jacq. v. *purpurea*.—3423 *purpurea* L. Fm. E(i).—3424 *purpurea* L. Fm. A.—3425 *glabra* Thunb.—3427 *fragilis* Salter v. *pellucida*.—3427B *fragilis* Salter.—3431, 3433 *pusilla* Jacq.—3440 *goniorrhiza* E & Z.—3441 *luteola* Jacq.—3442 *nidulans* E & Z.—3443 *glabra* Thunb.—3444 *multicaulis* E & Z. v. *stolonifera*.—3450 *goniorrhiza* E & Z.—3451 *purpurea* L. Fm. L.—3462 *Annae* Bol. f. Fm. A.—3471 *melanosticta* Sond.—3474 *primuloides* R. Knuth.—3478 *obtusa* Jacq.—3489 *Zeyheri* Sond.—3494 *melanosticta* Sond.—3499, 3502 *obtusa* Jacq.—3513 *simplex* Salter.—3515 *flava* L. Fm. G(ii).—3518 *luteola* Jacq.—3519 *obtusa* Jacq.—3541 *Urbaniana* Schltr.—3542 *aurea* Schltr.—3563 *glabra* Thunb.—3564, 3565 *nidulans* E & Z.—3566 *natans* L.f.—3580 *minuta* Thunb.—3583, 3592 *glabra* Thunb.

3645, 3658 *recticaulis* Sond.—3703 *obtusa* Jacq.—3706 *comosa* E. Mey. ex Sond.—3707 *pulchella* Jacq.—3709 *Louisae* Salter.—3710 *adenodes* Sond. Fm. B.—3718 *Dregei* Sond.—3722 *obtusa* Jacq. Fm. B.—3729, 3738 *obtusa* Jacq.—3749 *obtusa* Jacq. Fm. B.—3751 *obtusa* Jacq.—3784 *foveolata* Turcz.—3797, 3812, 3813 *obtusa* Jacq.—3814 *Dregei* Sond.—3815 *namaquana* Sond.—3918 *pusilla* Jacq.—4268 *obliquifolia* Steud. ex Rich.—4347 *bifida* Thunb.—4348 *Eckloniana* Presl. v. *Sonderi*.—4368 *setosa* E. Mey. ex Sond.—4369 *imbricata* E & Z. v. *violacea* Fm. B.—4370 *Bowiei* Lindl.—4371 *stenorrhyncha* Salter.—4372 *Smithiana* E & Z.—4378 *imbricata* E & Z. v. *violacea*. Fm. B.—4390 *truncatula* Jacq.—4391 *commutata* Sond.—4398 *polyphylla* Jacq. v. *alba*.

4401 *commutata* Sond. v. *concolor*.—4404 *obliquifolia* Steud. ex Rich. *inter. setosa* E. Mey. ex Sond.—4405 *polyphylla* Jacq.—4416 *versicolor* L. Fm. B.—4426 *hirta* L. v. *tubiflora*.—4427 *pallens* E & Z.—4428 *pulchella* Jacq. v. *tomentosa*.—4429 *Eckloniana* Presl. v. *Sonderi*.—4430 *polyphylla* Jacq. v. *pubescens*.—4431 *luteola* Jacq.—4432 *adpersa* E & Z.—4433 *aurea* Schltr.—4434 *luteola* Jacq.—4436, 4438 *monophylla* L. v. *minor*.—4440 *aridicola* Salter.—4442 *lineolata* Salter.—4443 *flava* L. Fm. B.—4444 *grammophylla* Salter Fm. C.—4445 *campicola* Salter.—4446 *flava* L. Fm. E.—4447 *callosa* R. Knuth.—4448 *stenopetala* Salter.—4455 *primuloides* R. Knuth.—4456 *densa* N.E. Br.—4457 *purpurea* L. Fm. A.—4458 *hirsuta* Sond.—4459 *grammopetala* Sond.—4463, 4467 *melanosticta* Sond.—4468 *primuloides* R. Knuth.—4469 *grammophylla* Salter Fm. A.—4470A *stenopetala* Salter.—4471, 4472 *callosa* R. Knuth.—4473 *flava* L. Fm. A.—4474 *Massoniana* Salter v. *flavescens*.—4475 *suteroides* Salter v. *latituba*.—4476 *flava* L. Fm. H.—4477 *melanosticta* Sond. v. *latifolia*.—4478 *Pocockiae* L. Bolus.—4479 *suteroides* Salter.—4485 *grammophylla* Salter Fm. D.—4486 *hirta* L. v. *tubiflora*.—4491 *leptocalyx* Sond.—4492 *Urbaniana* Schltr.—4494 *falcata* Salter.—4495

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monophylla L. v. stenophylla.—4496 hirta L. v. intermedia.—4497 lateriflora Jacq.—4498 tomentosa L.f.

4501 pes caprae L. v. sericea.—4502 commutata Sond.—4504 pusilla Jacq.—4506 tenuifolia Jacq.—4510 hirta L. Fm. F.—4512 hirta L. Fm. D.—4513 adspersa E & Z.—4514 hirta L. Fm. D.—4515 monophylla L. v. stenophylla.—4516 argyrophylla Salter.—4517 hirta L. v. tenuicaulis. Fm. A.—4519, 4520 suavis R. Knuth.—4521 hirta L. v. tenuicaulis Fm. B.—4523 Eckloniana Presl. Fm. B.—4524 polyphylla Jacq.—4526 hirta L. v. tenuifolia Fm. B.—4527 glabra Thunb.—4528 hirta L. v. polioeides.—4535 hirta L. Fm. F.—4536 Meisneri Sond. Fm. B.—4537 purpurea L. Fm. L.—4539 glabra Thunb.—4541 Meisneri Sond. Fm. C.—4545 leptocalyx Sond.—4547 aridicola Salter.—4548 lineolata Salter.—4555 lasiorrhiza Salter.—4556 suteroides Salter v. latituba.—4559 callosa R. Knuth.—4560 stenopetala Salter.—4561 reflexa Salter.—4562 argillacea Bolus f.—4566 Massoniana Salter v. flavescens.—4570 furcillata Salter v. caulescens.—4571 reclinata Jacq. v. gracillima.—4572 Louisae Salter.—4574 reclinata Jacq. v. gracillima.—4575 flaviuscula Salter v. longifolia.—4576 copiosa Bolus f. Fm. A.—4578 flaviuscula.—4579 obtusa Jacq.—4580 furcillata Salter.—4581 graminopetala Sond.—4582A, 4582B adenodes Sond. Fm. A.—4589 exserta Salter.—4590 pulchella Jacq. v. beneprotecta.—4600 pulchella Jacq. v. glauca.

4601 campylorrhiza Salter.—4602 adenodes Sond. B.—4603 helicoides Salter.—4606 campylorrhiza Salter.—4607 furcillata Salter v. caulescens.—4608 albiuscula Salter.—4609 clavifolia Sond.—4613 pulchella Jacq. v. glauca.—4614 stenoptera Turcz. v. undulata.—4621 versicolor L. Fm. A.—4628, 4629 tenuifolia Jacq.—4632 multicaulis E & Z.—4636 multicaulis E & Z. v. stolonifera.—4637 tenuifolia Jacq.—4640, 4642 versicolor L. Fm. B.—4646 versicolor L. Fm. A.—4659, 4660 multicaulis E & Z.—4690 obtusa Jacq.—4717 pes caprae L. v. sericea.—4743, 4777 lanata L. f. v. rosea.—4810 purpurea L. Fm. A.—4818 pes caprae L. Fm. A.—4860 heterophylla D.C.—4870 bifida Thunb. Fm. B.—4871 lanata L.f.—4873, 4879 heterophylla D.C.—4968 versicolor L. Fm. A.—4988 versicolor L. Fm. B.—5084 Stokoei Weintraub.

5234 incarnata L.—5239, 5242, 5243 dentata Jacq.—5246, 5247 polyphylla Jacq.—5248 semiloba Sond.—5249 Smithiana E & Z.—5251 polyphylla Jacq. v. alba.—5257 Eckloniana Presl. v. Sonderi.—5258 livida Jacq.—5259 glabra Thunb.—5260 droseroides E. Mey. ex Sond.—5261 Eckloniana Presl. v. Sonderi.—5262 hirta L. Fm. F.—5263 monophylla L. v. stenophylla.—5264 livida Jacq.—5265 droseroides E. Mey. ex Sond.—5266 Meisneri Sond. Fm. B.—5270 livida Jacq.—5271 polyphylla v. alba.—5272 hirta L. Fm. F.—5273 pes caprae L. v. sericea.—



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5274 *tenuifolia* Jacq.—5275 *adpersa* E & Z.—5276 *monophylla* L.—5280 *argyrophylla* Salter.—5281 *hirta* L. v. *intermedia*.—5284 *adpersa* E & Z.—5285 *variifolia* Steud. v. *ternata*.—5286 *lateriflora* Jacq.—5287 *tenella* Jacq.—5288 *adpersa* E & Z.—5290 *pallens* E & Z.—5291 *pulchella* Jacq. v. *tomentosa*.—5293 *hirta* L. v. *tubiflora*.—5295 *ebracteata* Savign.—5297 *aurea* Schltr.—5298 *adpersa* E & Z.—5300 *tenella* Jacq.

5301 *monophylla* L. v. *rotundifolia*.—5303A, 5303B *Salteri* L. Bolus.—5304 *Sonderiana* (O. Kze.) Salter v. *alba*.—5305 *hirta* L. v. *polioeides*.—5306 *flava* L. Fm. A.—5309 *Sonderiana* (O. Kze.) Salter v. *alba*.—5310, 5311 *fabaeifolia* Jacq. Fm. A.—5312 *purpurea* L. Fm. H.—5313 *fabaeifolia* Jacq. Fm. A.—5314 *gracilis* Jacq.—5315 *argillacea* Bolus f.—5316 *Salteri* L. Bolus.—5317 *argillacea* Bolus f.—5318 *reflexa* Salter.—5320 *fabaeifolia* Jacq. Fm. B(i)—5321 *deserticola* Salter.—5322 *melanograpta* Salter.—5323, 5324 *fabaeifolia* Jacq. Fm. B(ii)—5325 *argillacea* Bolus f.—5327 *reflexa* Salter.—5328 *purpurea* L. Fm. D.—5330 *fabaeifolia* Jacq. Fm. A.—5333 *purpurea* L. Fm. D.—5334 *flava* L. Fm. D.—5335 *stenoptera* Turcz. v. *alba*.—5336 *flava* L. Fm. C.—5337 *flava* L. Fm. E.—5339 *stenoptera* Turcz. v. *undulata*.—5340, 5341 *reclinata* Jacq.—5342 *stenoptera* Turcz. v. *undulata*.—5343 *linearis* Jacq.—5344A, 5344B *flava* L. Fm. D.—5345 *reclinata* Jacq.—5346 *gracilis* Jacq. v. *lilacea*.—5347 *clavifolia* Sond.—5348 *Sonderiana* (O. Kze.) Salter v. *alba*.—5349 *stenoptera* Turcz.—5350 *pulchella* Jacq. v. *tomentosa*.—5354 *petraea* Salter.—5357 *tenella* Jacq.—5358 *pes caprae* L. Fm. B.—5359 *Pocockiae* L. Bolus.—5360 *Massoniana* Salter.—5361 *melanosticta* Sond. v. *latifolia*.—5362 *flava* L. Fm. H.—5363 *callosa* R. Knuth.—5364, 5365 *grammophylla* Salter Fm. D.—5371 *rubro-punctata* Salter.—5372 *callosa* R. Knuth v. *minor*.—5373 *callosa* R. Knuth.—5374 *flava* L. Fm. E.—5375 *campicola* Salter.—5376 *grammophylla* Salter Fm. A.—5377 *grammophylla* Salter Fm. C.—5378 *aridicola* Salter.—5380, 5381 *flava* L. Fm. E.—5382 *lineolata* Salter.—5383 *grammophylla* Salter Fm. B.—5384 *lineolata* Salter.—5386 *xantha* Salter.—5387 *grammophylla* Salter. Fm. B.—5389 *tenella* Jacq.—5390, 5391 *flava* L. Fm. F.—5392 *monophylla* L. v. *minor*.—5394 *phloxidiflora* Schltr.—5397 *oreophila* Salter.—5398 *Eckloniana* Presl. v. *Sonderi*.—5399 *porphyriosiphon* Salter.—5400 *disticha* Jacq. v. *alba*.

5401 *suteroides* Salter v. *latituba*.—5403 *pulchella* Jacq. v. *tomentosa*.—5404 *pallens* E & Z.—5405 *viscosa* E. Mey. ex Sond.—5406 *purpurea* L. Fm. B.—5407, 5408 *adpersa* E & Z.—5409 *involuta* Salter.—5410 *capillacea* E. Mey. ex Sond. Fm. A.—5411 *versicolor* L. v. *flaviflora*.—5412 *adpersa* E & Z.—5413 *pulchella* Jacq. v. *tomentosa*.—5415 *lanata* L.f. v. *rosea*.—5416 *versicolor* L. Fm. B.—5417 *nidulans* E & Z. v.



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denticulata.—5418 argyrophylla Salter.—5419 luteola Jacq.—5420 versicolor L. Fm. A.—5425 fragilis Salter.—5426 fragilis Salter v. pellucida.—5427 perineson Salter & Exell.—5428 hirta L. v. polioeides.—5430 pallens E & Z.—5431 macra Schltr.—5431A, 5431B macra Schltr. × Creaseyi Salter (*Hybrid*).—5432 Eckloniana Presl. v. Sonderi.—5433 hirta L. v. tubiflora.—5438 linearis Jacq.—5445 purpurea L. Fm. E(iii).—5455 argillacea Bolus f.—5456 fabaefolia Jacq. Fm. B(i).—5457 argillacea Bolus f.—5459 Annae Bolus f. Fm. B.—5460 lichenoides Salter.—5461 argillacea Bolus f.—5462 bullulata Salter.—5470 purpurea L. Fm. D.—5476 gracilipes Schltr.—5481 purpurea L. Fm. I.—5484 leptocalyx Sond.—5487 petraea Salter.—5489 pes caprae L. Fm. B.—5490 senecta Salter.—5492 pes caprae L. Fm. B.—5493 Sonderiana (O. Kze.) Salter v. alba.—5494 Annae Bolus f. Fm. B.—5495 namaquana Sond.—5496 cathara Salter.—5497 purpurea L. Fms. A. *inter* G.—5498 reclinata Jacq. v. micromera.—5500 cathara Salter.

5501 gracilis Jacq. v. lilacea.—5508 obtusa Jacq.—5509 albiuscula Salter.—5511A, 5511B adenodes Sond. Fm. A.—5512 adenodes Sond. Fm. D.—5513 kamiesbergensis Salter.—5515 comosa E. Mey. ex Sond.—5523 Sonderiana (O. Kze.) Salter.—5524 flaviuscula Salter.—5525 grammopetala Sond.—5535 adenodes Sond. Fm. A.—5536 exserta Salter.—5537 Dregei Sond.—5538 furcillata Salter.—5544 exserta Salter.—5548 pulchella Jacq. v. glauca.—5550 crocea Salter.—5551 pulchella Jacq. v. glauca.—5552 bullulata Salter.—5553 campylorrhiza Salter.—5556 purpurea L. Fm. G.—5557, 5558 campylorrhiza Salter.—5564 adenodes Sond. Fm. B.—5565 Knuthiana Salter.—5566 flaviuscula Salter v. longifolia.—5569 Louisae Salter.—5570 adenodes Sond. Fm. D.—5571 furcillata Salter v. caulescens.—5572 albiuscula Salter.—5573 clavifolia Sond.—5574 ambigua Jacq. Fm. B.—5575 gracilis Jacq.—5576 ambigua Jacq. Fm. C.—5597, 5598 cathara Salter.—5599 gracilis Jacq.—5600 purpurea L. Fms. A. *inter* G.

5601 Annae Bolus f. Fm. B.—5602 copiosa Bolus f.—5606 purpurea L. Fm. D.—5607 blastorrhiza Salter.—5610 purpurea L. Fms. A. *inter* G.—5611 purpurea L. Fm. D.—5613 purpurea L. Fm. E(i).—5614 uliginosa Schltr.—5615 Dregei Sond.—5616 recticaulis Sond.—5617 disticha Jacq. v. alba.—5619 disticha Jacq.—5620 variifolia Steud. v. ternata.—5621 hirta L. v. polioeides.—5622 purpurea L. Fm. B.—5623 purpurea L. Fm. E.—5656 hirta L. v. polioeides.—5677 tenuifolia Jacq.—5781 haedulipes Salter.—5782 depressa E & Z.—5992 polyphylla Jacq.—5993 Eckloniana Presl. Fm. B.—5994, 5995, 5996 hirta L. v. tenuifolia Fm. A.—5998 flava L. Fm. G(i).—6000 tomentosa L.f.

6001 monophylla L. v. stenophylla.—6002 pes caprae L. v. sericea.—

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6003 *commutata* Sond.—6005 *tenuifolia* Jacq.—6006 *luteola* Jacq.—6010 *tragopoda* Salter.—6011 *Eckloniana* Presl. v. *Sonderi*.—6012 *versicolor* L. Fm. A.—6013 *polyphylla* Jacq. v. *alba*.—6014 *tenuifolia* Jacq.—6015 *Eckloniana* Presl. v. *hopefieldiana*.—6016 *commutata* Sond.—6017 *tenuifolia* Jacq.—6018 *hirta* L. Fm. F.—6019 *commutata* Sond.—6020 *luteola* Jacq.—6021 *lateriflora* Jacq.—6024 *polyphylla* Jacq. v. *penta-phylla*.—6025 *versicolor* L. Fm. B.—6026 *dentata* Jacq.—6030 *nidulans* E & Z.—6031 *truncatula* Jacq.—6032 *Eckloniana* Presl. v. *Sonderi*.—6033 *Engleriana* Schltr.—6035 *truncatula* Jacq.—6036 *Engleriana* Schltr.—6037 *goniorrhiza* E & Z.—6038 *punctata* L.f. Fm. A.—6039 *camelopardalis* Salter.—6040 *leptogramma* Salter.—6041 *pulchella* Jacq. v. *tomentosa*.—6042 *pardalis* Sond.—6043 *melanosticta* Sond.—6044 *ciliaris* Jacq. Fm. B.—6045 *leptogramma* Salter.—6046 *Burkei* Sond.—6047 *leptogramma* Salter v. *brevifolia*.—6048 *fibrosa* Bolus f.—6051 *ciliaris* Jacq. Fm. C.—6052 *leptogramma* Salter. v. *brevifolia*.—6053 *palmifrons* Salter.—6054, 6055 *purpurea* L. Fm. D.—6056 *capillacea* E. Mey ex Sond. Fm. C.—6057 *ciliaris* Jacq. Fm. C.—6061 *Burkei* Sond.—6062 *flava* L. Fm. A.—6063 *palmifrons* Salter.—6064 *ciliaris* Jacq. Fm. C.—6065 *Eckloniana* Presl. v. *Sonderi*.—6066 *leptogramma* Salter v. *brevifolia*.—6068 *melanosticta* Sond.—6069 *Burkei* Sond.—6070 *melanosticta* Sond.—6073 *ciliaris* Jacq. Fm. D.—6074 *depressa* E & Z.—6075 *convexula* Jacq.—6076 *leptogramma* Salter v. *lutea*.—6079 *Stokoei* Weintroub.—6080 *commutata* Sond.—6081 *capillacea* E. Mey. ex Sond. Fm. A.—6082 *Meisneri* Sond. Fm. D.—6083, 6084 *purpurea* L. Fm. K.—6085 *purpurea* L. Fm. L.—6086 *leptocalyx* Sond.—6087 *Meisneri* Sond. Fm. D.—6088 *purpurea* L. Fm. A.—6089 *leptocalyx* Sond.—6090 *ebracteata* Savign.—6091 *amblyodonta* Salter Fm. A.—6092 *purpurea* L. Fm. B.—6093 *pes caprae* L. v. *sericea*.—6095 *commutata* Sond.—6096 *goniorrhiza* E & Z.—6099 *minuta* Thunb.—6100 *glabra* Thunb.

6101 *Eckloniana* Presl. v. *Sonderi*.—6104 *fragilis* Salter.—6106 *pallens* E & Z.—6108 *reticulata* Sond.—6109 *tenella* Jacq.—6116 *pes caprae* L. Fm. B.—6123 *Pillansiana* Salter & Exell.—6127 *uliginosa* Schltr.—6128 *Dregei* Sond.—6139 *nidulans* E & Z.—6140 *tenuifolia* Jacq.—6141 *goniorrhiza* E & Z.—6142 *glabra* Thunb.—6143 *purpurea* L. Fm. A.—6144 *goniorrhiza* E & Z.—6145 *obtusa* Jacq.—6146 *argyrophylla* Salter.—6147 *stictocheila* Salter.—6149 *pusilla* Jacq.—6154 *luteola* Jacq.—6156 *nidulans* E & Z. v. *denticulata*.—6158, 6161 *nidulans* E & Z.—6162 *lanata* L.f. v. *rosea*.—6163 *lanata* L.f. (*virescent*).—6164 *lanata* L.f.—6165 *glabra* Thunb.—6167 *incarnata* L.—6171 *obtusa* Jacq.—6174 *zeekoevleyensis* R. Knuth.—6175 *obtusa* Jacq.—6176 *nidulans* E & Z.—6177 *zeekoevleyensis* R. Knuth.—6179, 6187 *heterophylla*

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6402, 6403 heterophylla D.C.—6573 hirta L. v. canescens.—6577 falcata Salter.—6581 polyphylla Jacq.—6582 commutata Sond. v. concolor.—6583 punctata L.f. Fm. A.—6586 Eckloniana Presl. Fm. C.—6587 hirta L. Fm. E.—6588 argyrophylla Salter.—6590 Eckloniana Presl. v. hopefieldiana.—6591 pes caprae L. v. sericea.—6593 lateriflora Jacq.—6595 pusilla Jacq.—6597 tenuifolia Jacq.—6598 Eckloniana Presl. v. Sonderi.—6599 commutata Sond.

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6710 convexula Jacq.—6720 dichotoma Salter.—6733 punctata L.f. Fm. C.—6735 purpurea L. Fm. F.—6736 imbricata E & Z. v. violacea.—6773 purpurea L. Fm. A.—6792, 6793 ciliaris Jacq. Fm. A.—6794

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orthopoda Salter.—6804 versicolor L. Fm. C.—6808 pes caprae L. × v. sericea.—6813 glabra Thunb.—6814 purpurea L. Fm. C.—6815, 6816 pes caprae L. Fm. A.—6826, 6827, 6828 purpurea L. Fm. J.—6830 pes caprae L. × v. sericea.—6833 lanata L.f. v. rosea.—6834 versicolor L. v. latifolia.—6848 natans L.f.—6849 pes caprae L. Fm. B.—6856 pes caprae L. Fm. A.—6863 versicolor L. Fm. C.—6864, 6866 versicolor L. Fm. A.—6888, 6889 lanata L.f. v. rosea.—6913 purpurea L. Fm. F.—6914 incarnata L.—6919 pendulifolia Salter.—6952 incarnata L.—7009 heterophylla D.C.—7064 glabra Thunb.—7184 pes caprae L. v. sericea.—7186 dentata Jacq.

7202 truncatula Jacq.—7204 polyphylla Jacq.—7205 punctata L.f. Fm. A.—7208 polyphylla Jacq.—7210 truncatula Jacq.—7213 Engleriana Schltr.—7214 stellata E & Z. v. glandulosa.—7217 Engleriana Schltr.—7219 stellata E & Z.—7221 duriuscula Schltr.—7227 polyphylla Jacq.—7234 pallens E & Z.—7235 luteola Jacq. v. minor.—7236 gracilipes Schltr.—7237 aurea Schltr.—7238 adpersa E & Z.—7242 pes caprae L. Fm. B.—7243 purpurea L. Fm. E(ii).—7244 Sonderiana (O. Kze.) Salter v. alba.—7245 purpurea L. Fm. E(ii).—7246 gracilis Jacq.—7247 purpurea L. Fm. E(ii).—7248 luteola Jacq.—7250 gracilipes Schltr.—7251 hirta L. tubiflora Fm. A.—7252 giftbergensis Salter.—7253 gracilis Jacq.—7254 Pillansiana Salter & Exell.—7255 Salteri L. Bolus.—7256 hirta L. v. polioeides.—7258 purpurea L. Fm. A.—7260 tenuis Salter.—7261 viscosa E. Mey. ex Sond.—7263 giftbergensis Salter.—7266 oligophylla Salter.—7267 tenuipes Salter.—7286 Comptonii Salter.—7287 purpurea L. Fm. A.—7288 obtusa Jacq.—7289 pes caprae L. v. sericea.—7290 flava L. Fm. H.—7292 Comptonii Salter.—7294 giftbergensis Salter.

7311 gracilipes Schltr.—7312 glabra Thunb.—7316 Salteri L. Bolus.—7317 obtusa Jacq.—7325 stenopetala Salter.—7326 suteroides Salter v. latituba.—7327 stenopetala Salter.—7328 purpurea L. Fm. D.—7331 reflexa Salter.—7337 primuloides R. Knuth.—7339 purpurea L. Fm. D.—7340 pulvinata Salter.—7341 pes caprae L. v. sericea.—7343, 7344 pes caprae L. Fm. A.—7348 fabaefolia Jacq. Fm. A.—7350 livida Jacq. v. altior.—7359 lateriflora Jacq.—7460 bifida Thunb. Fm. B.—7516 flava L. Fm. G(ii).—7579 luteola Jacq.—7640, 7736 versicolor L. Fm. A.—7743, 7744 pes caprae L. Fm. A.

8053 Eckloniana Presl. v. Sonderi.—8054 polyphylla Jacq.—8055 commutata Sond.—8064 hirta L. Fm. A.—8065 luteola Jacq.—8066 polyphylla Jacq.—8067 punctata L.f. Fm. A.—8068 versicolor L. Fm. A.—8071 polyphylla Jacq.—8072 caprina L.—8073 depressa E & Z.—8074 hirta L. Fm. A.—8077 bifida Thunb.—8078 stellata E & Z. v. glandulosa.—8079 Pocockiae L. Bolus.—8081 commutata Sond. v. con-



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color.—8084 flava L. Fm. A.—8085, 8086 pes caprae L. v. sericea.—8087 tomentosa L.f.—8088 monophylla L.—8089 hirta L. v. canescens.—8090 punctata L.f. Fm. A.—8091 falcatula Salter.—8092 polyphylla Jacq. v. pentaphylla.—8033 caprina L.—8035 confertifolia (O. Kze.) R. Knuth.—8096 hirta L. Fm. A.—8097 hirta L. Fm. E.—8098 argyrophylla Salter.—8099 pusilla Jacq.

8101 dentata Jacq.—8102 luteola Jacq.—8103 versicolor L. Fm. B.—8109 versicolor L. Fm. A.—8110 minuta Thunb.—8111 Eckloniana Presl. v. Sonderi.—8112 purpurea L. Fm. A.—8113 versicolor L. Fm. A.—8114 commutata Sond.—8117 polyphylla Jacq. v. minor.—8118 Stokoei Weintroub.—8120 capillacea E. Mey. ex Sond. Fm. A.—8121 versicolor L. Fm. B.—8122 leptocalyx Sond.—8123 polyphylla Jacq. v. pubescens.—8125 hirta L. v. tubiflora.—8126 purpurea L. Fm. E(i).—8128 giftbergensis Salter.—8129 pes caprae L. v. sericea.—8135 orcophila Salter.—8136 pes caprae L. v. sericea.—8139 tenella Jacq.—8140 livida Jacq. ? v. altior.—8141 phloxidiflora Schltr.—8142 monophylla L. v. minor.—8143 giftbergensis Salter.—8144 tenella Jacq.—8145 aurea Schltr.—8146 ebracteata Savign.—8147 adspersa E & Z.—8149 glabra Thunb.—8150 hirta L. v. tubiflora Fm. A.—8151 gracilipes Schltr.—8152 luteola Jacq.—8153 Eckloniana Presl. Fm. B.—8155, 8156 glabra Thunb.—8158 hirta L. v. polioeides.—8158 ebracteata Savign.—8159 adspersa E & Z.—8165 multicaulis E & Z.—8166 nidulans E & Z.—8172 pusilla Jacq.—8184 57 versicolor L. Fm. A.—8184 purpurea L. Fm. C.

8219 tenuifolia Jacq.—8241 flava L. Fm. F.—8377 livida Jacq.—8388 falcatula Salter *inter* polyphylla Jacq.—8395 polyphylla Jacq. v. pentaphylla.—8406 commutata Sond.—8407, 8408, 8445 commutata Sond. v. concolor.—8625 argyrophylla Salter.—8627 hirta L. v. intermedia.—8629 argyrophylla Salter.—8630 hirta L. Fm. B.—8631 purpurea L. Fm. A.—8632 pes caprae L. v. sericea.—8633 hirta L. Fm. D.—8634 adspersa E & Z.—8635 hirta L. v. tenuicaulis Fm. A.—8637 flava L. Fm. G(i).—8638 Eckloniana Presl. Fm. B.—8639 hirta L. Fm. A.—8640 pusilla Jacq.—8641 polyphylla Jacq. v. alba.—8680 pes caprae L. Fm. A.—8745 strigosa Salter.—8746 commutata Sond.—8747 luteola Jacq.—8748 livida Jacq.—8749 lateriflora Jacq.—8750 tenuifolia Jacq.



## ABBREVIATIONS.

B.H.	..	..	Bolus Herbarium, University of Cape Town.
Cape Penin.	..	..	Cape Peninsula.
Clanw. Div.	..	..	Clanwilliam Division.
E. London	..	..	East London.
E. & Z.	..	..	Ecklon and Zeyher.
Fl. Cap.	..	..	Flora Capensis, Harvey and Sonder.
Fl.	..	..	Flowering (season).
Griqualand E.	..	..	Griqualand East.
Jacq. Oxal.	..	..	Jacquin's <i>Oxalis</i> Monographia, 1794.
Journ. of S.A. Bot.	..	..	Journal of South African Botany.
King W's Town	..	..	King William's Town.
M. Bay	..	..	Mossel Bay.
MacO.	..	..	MacOwan.
Malmesb.	..	..	Malmesbury.
Murl.	..	..	Marloth.
Namaq.	..	..	Namaqualand.
O. F. State	..	..	Orange Free State.
P. Albert	..	..	Prince Albert.
P. Eliz.	..	..	Port Elizabeth.
P. Sl. Mem. Ex.	..	..	Percy Sladen Memorial Expedition.
Pflrch-Ox.	..	..	Das Pflanzenreich IV, 130, Oxalidaceae, 1930.
Piqbg.	..	..	Piquetberg.
S.	..	..	Salter (in citation of specimens).
S.A.M.	..	..	South African Museum, Cape Town.
Som. E.	..	..	Somerset East.
V. R's Dorp, and Pass	..	..	Van Rhyn's Dorp and Pass.
W-Dod.	..	..	Wolley-Dod.
Worces.	..	..	Worcester.

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Names marked with an asterisk have not been validly published. Varieties are only included when they have been transferred from one species to another.

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